केंद्रीय विद्यालय संगठन क्षेत्रीय कार्यालय रायपुर

Kendriya Vidyalaya Sangathan Regional Office Raipur

Class - XII

Multiple Choice Question Bank [MCQ] Term – I

MATHEMATICS [041]

Based on Latest CBSE Exam Pattern for the Session 2021-22

केंद्रीय विद्यालय संगठन क्षेत्रीय कार्यालय रायपुर

Kendriya Vidyalaya Sangathan Regional Office Raipur

MESSAGE FROM DUPUTY COMMISSIONER

It is a matter of great pleasure for me to publish study material for different subjects of classes X and XII for Raipur Region. Getting acquainted and familiarized with the recent changes in curriculum and assessment process made by CBSE vide Circular No. 51 and 53 issued in the month of July 2021 will help students to prepare themselves better for the examination. Sound and deeper knowledge of the Units and Chapters is must for grasping the concepts, understanding the questions. Study materials help in making suitable and effective notes for quick revision just before the examination.

Due to the unprecedented circumstances of COVID-19 pandemic the students and the teachers are getting very limited opportunity to interact face to face in the classes. In such a situation the supervised and especially prepared value points will help the students to develop their understanding and analytical skills together. The students will be benefitted immensely after going through the question bank and practice papers. The study materials will build a special bond and act as connecting link between the teachers and the students as both can undertake a guided and experiential learning simultaneously. It will help the students develop the habit of exploring and analyzing the ***Creative & Critical Thinking Skills***. The new concepts introduced in the question pattern related to case study, reasoning and ascertain will empower the students to take independent decision on different situational problems. The different study materials are designed in such a manner to help the students in their self-learning pace. It emphasizes the great pedagogical dictum that *'everything can be learnt but nothing can be taught'*. The self-motivated learning as well as supervised classes will together help them achieve the new academic heights.

I would like to extend my sincere gratitude to all the principals and the teachers who have relentlessly striven for completion of the project of preparing study materials for all the subjects. Their enormous contribution in making this project successful is praiseworthy.

Happy learning and best of luck!

Vinod Kumar
(Deputy Commissioner)

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Kendriya Vidyalaya Sangathan Regional Office Raipur

Our Patorn

Vinod Kumar
Deputy Commissioner
KVS RO Raipur

Smt.Biraja Mishra
Assistant Commissioner
KVS RO Raipur

Sh.A.K. Mishra
Assistant Commissioner
KVS RO Raipur

Shri Satish Kumar
Principal, Kendriya Vidyalaya Jashpur

CONTENT TEAM

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Shri ROHIT SAHU, PGT MATHS KV KIRANDUL

Shri D P CHAUBEY, PGT MATHS KV JHAGRAKHAND

Shri PRAVESH KUMAR, PGT MATHS KV CHIRMIRI

Shri U K KURREY, PGT MATHS KV No. 1 (Shift – 1) RAIPUR

Mrs T PANIGRAHI, PGT MATHS KV RAIGARH

Shri K K JHA, PGT MATHS KV No. 2 RAIPUR

Shri R K TRIPATHI, PGT MATHS KV CISF BHILAI

Shri T P CHAURASIYA, PGT MATHS KV AMBIKAPUR

Shri SRIJAN SINGH, PGT MATHS KV BAIKUNTHPUR

COMPILED BY

Shri MANOJ GUPTA, PGT MATHS KV JAGDALPUR

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RELATIONS AND FUNCTIONS

MULTIPLE CHOICE QUESTIONS

Question 1. The relation R on the set A ={1,2,3} given by R = $\{(1,1),(1,2),(2,2),(2,3),(3,3)\}$ is
a) Reflexive b) Symmetric c) Transitive d) Equivalence

Question 2. Let f: $R \to R$ be defined as f(x) =3x - 2. Choose the correct answer.
a) f is one-one onto b)f is many one onto
c)f is one-one but not onto d)f is neither one-one nor onto

Question 3. Let R be a relation defined on Z as R= {(a,b) ; $a^2+b^2=25$ } , the domain of R is;
(a) {3,4,5} (b) {0,3,4,5} (c) {0,3,4,5,-3,-4,-5} (d) none

Question 4.letR be the relation in the set N given by R={(a,b):a=b-2,b>6}.Choose the correct answer.
(a) (2,4)€R (b) (3,8) € R (c) (6,8)€ R (d) (8,10) € R

Question 5. Set A has 3 elements and set B has 4 elements. Then the number of injective functions that can be defined from set A to set B is
(a) 144 (b)12 (c)24 (d)64

Question 6. Let R be a relation on set of lines as L_1 R L_2 if L_1 is perpendicular to L_2. Then
a) R is Reflexive
b) R is transitive
c) R is symmetric
d) R is an equivalence relation

Question 7. Let f: R → R is defined as f(x) = 3x then f is
a) f is one-one and onto
b) f is one-one but not onto
c) f is many-one
d) f is neither one-one nor onto

Question 8.A Relation from A to B is an arbitrary subset of:
a) AxB b) BxBc)AxA d)BxB

Question 9. Let T be the set of all triangles in the Euclidean plane, and let a relation R on T be defined as aRb if a is congruent to b ∀ a, b ∈ T. Then R is
(a) reflexive but not transitive
(b) transitive but not symmetric
(c) equivalence
(d) None of these

Question 10. The maximum number of equivalence relations on the set A = {1, 2, 3} are
(a) 1
(b) 2
(c) 3
(d) 5

Question 11. Let us define a relation R in R as aRb if a ≥ b. Then R is
(a) an equivalence relation
(b) reflexive, transitive but not symmetric
(c) symmetric, transitive but not reflexive
(d) neither transitive nor reflexive but symmetric

Question 12. Let A = {1, 2, 3} and consider the relation R = {(1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)}. Then R is
(a) reflexive but not symmetric
(b) reflexive but not transitive
(c) symmetric and transitive
(d) neither symmetric, nor transitive

Question 13. Which of the following functions from Z into Z are bijective?
(a) $f(x) = x^3$
(b) f(x) = x + 2
(c) f(x) = 2x + 1
(d) $f(x) = x^2 + 1$

Question 14. Let R be a relation on the set N of natural numbers denoted by nRm⇔ n is a factor of m (i.e. n | m). Then, R is

(a) Reflexive and symmetric
(b) Transitive and symmetric
(c) Equivalence
(d) Reflexive, transitive but not symmetric

Question 15. Let S = {1, 2, 3, 4, 5} and let A = S × S. Define the relation R on A as follows:
(a, b) R (c, d) iff ad = cb. Then, R is
(a) reflexive only
(b) Symmetric only
(c) Transitive only
(d) Equivalence relation

Question 16. Let X = {-1, 0, 1}, Y = {0, 2} and a function f : X → Y defined by $y = 2x^4$, is
(a) one-one onto
(b) one-one into
(c) many-one onto
(d) many-one into

Question 17. Let A = R – {3}, B = R – {1}. Let f : A → B be defined by f(x)=(x−2)/(x−3). Then,
(a) f is bijective
(b) f is one-one but not onto
(c) f is onto but not one-one
(d) None of these

Question 18. The mapping f : N → N is given by $f(n) = 1 + n^2$, n ∈ N when N is the set of natural numbers is
(a) one-one and onto
(b) onto but not one-one
(c) one-one but not onto
(d) neither one-one nor onto

Question 19. The function f : R → R given by $f(x) = x^3 – 1$ is
(a) a one-one function
(b) an onto function
(c) a bijection
(d) neither one-one nor onto

Question 20. Let f : [0, ∞) → [0, 2] be defined by f(x)=2x/1+x, then f is
(a) one-one but not onto
(b) onto but not one-one
(c) both one-one and onto
(d) neither one-one nor onto

Question 21. If N be the set of all-natural numbers, consider f : N → N such that f(x) = 2x, ∀ x ∈ N, then f is
(a) one-one onto
(b) one-one into
(c) many-one onto
(d) None of these

Question 22. Let A = {x : -1 ≤ x ≤ 1} and f : A → A is a function defined by f(x) = x |x| then f is
(a) a bijection
(b) injection but not surjection
(c) surjection but not injection
(d) neither injection nor surjection

Question 23. Let f : R → R be a function defined by $f(x) = x^3 + 4$, then f is
(a) injective
(b) surjective
(c) bijective
(d) none of these

Question 24. Let R be a relation on the set L of lines defined by l_1 R l_2 if l_1 is perpendicular to l_2, then relation R is
(a) reflexive and symmetric
(b) symmetric and transitive
(c) equivalence relation
(d) symmetric

Question 25. Given set A ={1, 2, 3} and a relation R = {(1, 2), (2, 1)}, the relation R will be
(a) reflexive if (1, 1) is added
(b) symmetric if (2, 3) is added

(c) transitive if (1, 1) is added
(d) symmetric if (3, 2) is added

Question 26. Given set A = {a, b, c). An identity relation in set A is
(a) R = {(a, b), (a, c)}
(b) R = {(a, a), (b, b), (c, c)}
(c) R = {(a, a), (b, b), (c, c), (a, c)}
(d) R= {(c, a), (b, a), (a, a)}

Question 27. Set A has 3 elements and the set B has 4 elements. Then the number of injective functions that can be defined from set A to set B is
(a) 144
(b) 12
(c) 24
(d) 64

CASE STUDY QUESTIONS

CASE STUDY- 1

A relation R on a set A is said to be an equivalence relation on A if it is
• Reflexive i.e., (a, a) ∈ R ∀ a ∈ A.
• Symmetric i.e., (a, b) ∈ R ⇒ (b, a) ∈ R ∀ a, b ∈ A.
• Transitive i.e., (a, b) ∈ R and (b, c) ∈ R ⇒ (a, c) ∈ R ∀ a, b, c ∈A.
Based on the above information, answer the following questions:

1. If the relation R = {(1, 1), (1, 2), (1, 3), (2, 2), (2, 3), (3, 1), (3, 2), (3, 3)} defined on the set A = {1, 2, 3}, then R is
(a) reflexive
(b) symmetric
(c) transitive
(d) equivalence

2. If the relation R = {(1, 2), (2, 1), (1, 3), (3, 1)} defined on the set A = {1, 2, 3}, then R is
(a) reflexive
(b) symmetric
(c) transitive
(d) equivalence

3. If the relation R on the set N of all natural numbers defined as R = {(x, y) : y = x + 5 and (x < 4), then R is
(a) reflexive
(b) symmetric
(c) transitive
(d) equivalence

CASE STUDY-2

ONE – NATION
ONE – ELECTION
FESTIVAL
OF DEMOCRACY
GENERAL ELECTION – 2019

A general election of Lok Sabha is a gigantic exercise. About 911 million people were eligible to vote and voter turnout was about 67%, the highest ever.

Let I be the set of all citizens of India who were eligible to exercise their voting right in general election held in 2019. A relation 'R' is defined on I as follows:
R = $\{(V1,2): V1,V2 \in I$ and both use their voting right in general election – 2019$\}$

1. Two neighbors X and Y∈ I. X exercised his voting right while Y did not cast her vote in general election – 2019. Which of the following is true?
a. (X,Y) ∈R
b. (Y,X) ∈R
c. (X,X) ∉R
d. (X,Y) ∉R
2. Mr.'X' and his wife 'W'both exercised their voting right in general election -2019, Which of the following is true?
a. both (X,W) and (W,X) ∈ R
b. (X,W) ∈ R but (W,X) ∉ R
c. both (X,W) and (W,X) ∉ R
d. (W,X) ∈ R but (X,W) ∉ R
3. Three friends F_1, F2 and F_3 exercised their voting right in general election-2019, then which of the following is true?
a. (F1,F2) ∈R, (F2,F3) ∈ R and (F1,F3) ∈ R
b. (F1,F2) ∈ R, (F2,F3) ∈ R and (F1,F3) ∉ R
c. (F1,F2) ∈ R, (F2,F2) ∈R but (F3,F3) ∉ R
d. (F1,F2) ∉ R, (F2,F3) ∉ R and (F1,F3) ∉ R
4. The above defined relation R is _____
a. Symmetric and transitive but not reflexive
b. Universal relation
c. Equivalence relation
d. Reflexive but not symmetric and transitive
5. Mr. Shyam exercised his voting right in General Election – 2019, then Mr. Shyam is related to which of the following?
a. All those eligible voters who cast their votes
b. Family members of Mr.Shyam
c. All citizens of India
d. Eligible voters of India

CASE STUDY- 3

Sherlin and Danju are playing Ludo at home during Covid-19. While rolling the dice, Sherlin's sister Raji observed and noted the possible outcomes of the throw every time belongs to set {1,2,3,4,5,6}. Let A be the set of players while B be the set of all possible outcomes. A = {S, D}, B = {1,2,3,4,5,6}

1. Let R: $B \to B$ be defined by R = $\{(x,): y \; is \; divisible \}$ is
a. Reflexive and transitive but not symmetric
b. Reflexive and symmetric and not transitive
c. Not reflexive but symmetric and transitive
d. Equivalence
2. Raji wants to know the number of functions from A to B. How many number of functions are possible?
a. 6^2
b. 2^6
c. 6!
d. 2^{12}
3. Let R be a relation on B defined by R = {(1,2), (2,2), (1,3), (3,4), (3,1), (4,3), (5,5)}. Then R is
a. Symmetric
b. Reflexive
c. Transitive
d. None of these three
4. Raji wants to know the number of relations possible from A to B. How many numbers of relations are possible?
a. 6^2
b. 2^6
c. 6!
d. 2^{12}
5. Let R:$B \to B$ be defined by R={(1,1),(1,2), (2,2), (3,3), (4,4), (5,5),(6,6)}, then R is
a. Symmetric
b. Reflexive and Transitive
c. Transitive and symmetric
d. Equivalence

CASE STUDY 4

Consider the mapping f : A $\to$ B is defined by f(x) = $x - 1/x - 2$such that f is a bijection.
Based on the above information, answer the following questions:

1. Domain off is
(a) R – {2}
(b) R
(c) R – {1, 2}
(d) R – {0}
2. Range of f is
(a) R
(b) R – {1}
(c) R – {0}
(d) R – {1, 2}
3. If g : R – {2} $\to$ R – {1} is defined by g(x) = 2f(x) – 1, then g(x) in terms of x is
(a) $x + 2/x$
(b) $x + 1/x - 2$
(c) $x - 2/x$
(d) $x/x - 2$
4. The function g defined above, is
(a) One-one
(b) Many-one
(c) into
(d) None of these
5. A function f(x) is said to be one-one if
(a) $f(x_1) = f(x_2) \Rightarrow - x_1 = x_2$
(b) $f(-x_1) = f(-x_2) \Rightarrow - x_1 = x_2$
(c) $f(x_1) = f(x_2) \Rightarrow x_1 = x_2$
(d) None of these

ASSERTION AND REASON

Read Assertion and reason carefully and write correct option for each question

(a) Both A and R are correct; R is the correct explanation of A.
(b) Both A and R are correct; R is not the correct explanation of A.
(c) A is correct; R is incorrect.
(d) R is correct; A is incorrect.

1 **Assertion (A)**Let L be the set of all lines in a plane and R be the relation in L defined as
R = {(L1, L2) : L1 is perpendicular to L2}. R is not equivalence realtion.
Reason (R)R is symmetric but neither reflexive nor transitive
2 **Assertion**= {(T1, T2) : T1 is congruent to T2}. Then R is an equivalence relation.
Reason(R) Any relation R is an equivalence relation, if it is reflexive, symmetric and transitive
3 **Assertion (A)**The relation R in the set {1, 2, 3} given by R = {(1, 1), (2, 2),(3, 3), (1, 2), (2, 3)} is reflexive but neither symmetric nor transitive.
Reason (R)R is not symmetric, as (1, 2) ∈R but (2, 1) ∉R. Similarly, R is not transitive, as (1, 2) ∈R and (2, 3) ∈R but (1, 3) ∉R.
4 **Assertion (A)** Show that the relation R in the set A of all the books in a library of a college,
given by R = {(x, y) :x and y have same number of pages} is not equivalence relation.
Reason (R) Since R is reflexive, symmetric and transitive.
5. **Assertion (A)** The relation R in **R** defined as R = {(a, b) :$a \leq b$} is not equivalence relation.
Reason (R) Since R is not reflexive but it is symmetric and transitive.
6. Assertion (A) The relation R in **R** defined as R = {(a, b) :$a \leq b^2$} is not equivalence relation.
Reason (R) Since R is not reflexive but it is symmetric and transitive.
7 **Assertion (A)**The relation R in the set **Z** of integers given by R = {(a, b) : 2 divides $a - b$} is reflexive and symmetric
Reason (R)R is reflexive, as 2 divides ($a - a$) for all $a \in$**Z**.
8. **Assertion (A)** Let R be the relation defined in the set A = {1, 2, 3, 4, 5, 6, 7} by R = {(a, b) : both a and b are either odd or even}. R is an equivalence relation
Reason (R) Since R is reflexive, symmetric but R is not transitive.
9. **Assertion (A)** Let R be the relation in the set {1, 2, 3, 4} given by R = {(1, 2), (2, 2), (1, 1), (4,4), (1, 3), (3, 3), (3, 2)}. R is not equivalence relation.
Reason (R) R is not Reflexive relation but it is symmetric and transitive
10. **Assertion (A)** if n (A) = p and n(B) = q The number of relation from set A to B is pq
Reason (R) The number of subset of A X B is 2^{pq}
11**. Assertion (A)**A function f : X →Y is said to be *one-one* and *onto* (or *bijective*)
Reason (R) if f is both one-one and onto.
12. **Assertion (A)** The function f :**N**→**N**, given by $f(x) = 2x$, is one-one
Reason (R) The function f is one-one, for $f(x) = f(y) \Rightarrow 2x = 2y \Rightarrow x = y$.
13 **Assertion (A)** The function f :**N**→**N**, given by $f(x) = 2x$, is not onto
Reason (R) The function f is onto, for $f(x) = f(y) \Rightarrow 2x = 2y \Rightarrow x = y$.
14 **Assertion (A)** the function f :**N**→**N**, given by $f(1) = f(2) = 1$ and $f(x) = x - 1$, for every $x > 2$, is onto but not one-one.
Reason (R) $f$is not one-one, as $f(1) = f(2) = 1$. But f is onto, as given any $y \in$**N**, $y \neq 1$, we can choose x as $y + 1$ such that $f(y + 1) = y + 1 - 1 = y$. Also for 1 ∈**N**, we have $f(1) = 1$.
15 **Assertion (A)** A one-one function f : {1, 2, 3} →{1, 2, 3} must be onto.
Reason (R) Since f is one-one, three elements of {1, 2, 3} must be taken to 3 different elements of the co-domain {1, 2, 3} under f.
16 **Assertion (A)** Let A = {1, 2, 3}, B = {4, 5, 6, 7} and let f = {(1, 4), (2, 5), (3, 6)} be a function From A to B. Then f is one-one.
Reason (R) Since the function f : **N**→**N**, given by $f(x) = 2x$, is not onto

17. **Assertion (A)** Let A and B be sets. Show that $f : A \times B \to B \times A$ such that $f(a, b) = (b, a)$ is bijective function
Reason (R) f is said to equivalence relation if f is reflexive , symmetric and transitive
18. **Assertion (A)** The number of all one-one functions from set A = {1, 2, 3} to itself is 6
Reason (R) if n (A) = p and n(B) = q The number of function from set A to B is pq
19 **Assertion (A)** The Modulus Function $f : \mathbf{R} \to \mathbf{R}$, given by $f(x) = |x|$ is not one one and onto function
Reason (R) The Modulus Function $f : \mathbf{R} \to \mathbf{R}$, given by $f(x) = |x|$ is bijective function
20. **Assertion (A)** Let A = {1, 2, 3}, B = {4, 5, 6, 7} and let $f = \{(1, 4), (2, 5), (3, 6)\}$ be a function from A to B. Then f is one-one.
Reason (R) f is bijective function

INVERSE TRIGONOMETRIC FUNCTION

MULTIPLE CHOICE QUESTIONS

Question 1. $\sin(\sec^{-1} x + \text{cosec}^{-1} x) =$
(a) 1
(b) -1
(c) $\pi/2$
(d) $\pi/3$
Question 2. The principle value of $\sin^{-1}(\sqrt{3}/2)$ is
(a) $2\pi/3$
(b) $\pi/6$
(c) $\pi/4$
(d) $\pi/3$
Question 3. Simplified form of $\cos^{-1}(4x^3 - 3x)$
(a) $3 \sin^{-1} x$
(b) $3 \cos^{-1} x$
(c) $\pi - 3 \sin^{-1} x$
(d) None of these
Question 4. $\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$ is equal to
(a) π
(b) $-\pi/3$
(c) $\pi/3$
(d) $2\pi/3$
Question 5. If $y = \sec^{-1} x$ then
(a) $0 \le y \le \pi$
(b) $0 \le y \le \pi/2$
(c) $-\pi/2 < y < \pi/2$
(d) None of these
Question 6. If $x + (1/x) = 2$ then the principal value of $\sin^{-1} x$ is
(a) $\pi/4$
(b) $\pi/2$
(c) π
(d) $3\pi/2$
Question 7. The principle value of $\sin^{-1}(\sin 2\pi/3)$ is
(a) $2\pi/3$
(b) $\pi/3$
(c) $-\pi/6$
(d) $\pi/6$

Question 8. The value of $\cos^{-1}(1/2) + 2\sin^{-1}(1/2)$ is equal to
(a) $\pi/4$
(b) $\pi/6$
(c) $2\pi/3$
(d) $5\pi/6$
Question 9. Principal value of $\tan^{-1}(-1)$ is
(a) $\pi/4$
(b) $-\pi/2$
(c) $5\pi/4$
(d) $-\pi/4$
Question 10. Principal value of $\sin^{-1}(1/\sqrt{2})$
(a) $\pi/4$
(b) $3\pi/4$
(c) $5\pi/4$
(d) None of these
Question 11. $\sin^{-1} x = y$ Then
(a) $0 \leq y \leq \pi$
(b) $-\pi/2 \leq y \leq \pi/2$
(c) $0 < y < \pi$
(d) $-\pi/2 < y < -\pi/2$
Question 12. $\cos^{-1}(\cos 7\pi/6)$ is equal to
(a) $7\pi/6$
(b) $5\pi/6$
(c) $\pi/3$
(d) $\pi/6$
Question 13. $\sin[\pi/3 - \sin^{-1}(-1/2)]$ is equal to
(a) $1//2$
(b) $1/3$
(c) $1/4$
(d) 1
Question 14. The principal value of $\text{cosec}^{-1}(-2)$ is
(a) $-2\pi/3$
(b) $\pi/6$
(c) $2\pi/3$
(d) $-\pi/6$
Question 15. The domain of the following $f(x) = \sqrt{(\sin^{-1}x)}$is.
(a) [0, 1]
(b) [-1, 1]
(c) [-2, 0]
(d) [0, 1]
Question 16. Which of the following is the principal value branch of $\cos^{-1} x$?
(a) $[-\pi/2, \pi/2]$
(b) (0, π)
(c) [0, π]
(d) $(0, \pi) - \{\pi/2\}$
Question 17. Which of the following is the principal value branch of $\text{cosec}^{-1} x$?
(a) $(-\pi/2, \pi/2)$
(b) $(0, \pi) - \{\pi/2\}$
(c) $[-\pi/2, \pi/2]$
(d) $[-\pi/2, \pi/2] - [0]$
Question 18. If $3\tan^{-1} x + \cot^{-1} x = \pi$, then x equals
(a) 0
(b) 1
(c) -1
(d) 12

Question 19. The value of $\cos^{-1}[\cos(33\pi/5)]$ is
(a) $3\pi/5$
(b) $-3\pi/5$
(c) $\pi/10$
(d) $-\pi/10$
Question 20. The domain of the function $\cos^{-1}(2x - 1)$ is
(a) [0, 1]
(b) [-1, 1]
(c) [-1, -1]
(d) [0, π]
Question 21. The domain of the function defined by $f(x) = \sin^{-1}\sqrt{(x-1)}$ is
(a) [1, 2]
(b) [-1, 1]
(c) [0, 1]
(d) None of these
Question 22. If $\cos(\sin^{-1}2/5 + \cos^{-1} x) = 0$ then x is equal to
(a) $1/5$
(b) $2/5$
(c) 0
(d) 1
Question 23. The value of $\sin(2\tan^{-1}(0.75))$ is equal to
(a) 0.75
(b) 1.5
(c) 0.96
(d) sin (1.5)
Question 24. The value of $\cos^{-1}(\cos 3\pi/2)$ is equal to
(a) $\pi/2$
(b) $3\pi/2$
(c) $5\pi/2$
(d) $-7\pi/2$
Question 25. The value of expression $2\sec^{-1}(2) + \sin^{-1}(1/2)$ is
(a) $\pi/6$
(b) $5\pi/6$
(c) $7\pi/6$
(d) 1
Question 26. If $\sin^{-1}(2a/1+a^2) + \cos^{-1}(1-a^2/1+a^2) = \tan^{-1}(2x/1-x^2)$ where a, $x \in |0, 1|$ then the value of x is
(a) 0
(b) a^2
(c) a
(d) $2a/1-a^2$
Question 27. The value of $\sin[\cos^{-1}(7/25)]$ is
(a) $25/24$
(b) $25/7$
(c) $24/25$
(d) $7/24$
Question 28. $\sin^{-1}(-1/2)$
(a) $\pi/3$
(b) $-\pi/3$
(c) $\pi/6$
(d) $-\pi/6$
Question 29. $\sec^{-1}(-2/\sqrt{3})$
(a) $\pi/6$
(b) $\pi/3$
(c) $5\pi/6$
(d) $-2\pi/3$

Question 30. $\cos^{-1}(1/2)$
(a) $-\pi/3$
(b) $\pi/3$
(c) $\pi/2$
(d) $2\pi/3$
Question 31. $\text{cosec}^{-1}(-2/\sqrt{3})$
(a) $-\pi/3$
(b) $\pi/3$
(c) $\pi/2$
(d) $-\pi/2$
Question 32. $\cot^{-1}(1)$
(a) $\pi/3$
(b) $\pi/4$
(c) $\pi/2$
(d) 0
Question 33. $\cos^{-1}(\sqrt{3}/2)$
(a) $5\pi/6$
(b) $\pi/6$
(c) $4\pi/9$
(d) $2\pi/3$
Question 34. $\text{cosec}^{-1}(2)$
(a) $\pi/6$
(b) $2\pi/3$
(c) $5\pi/6$
(d) 0
Question 35. $\sec^{-1}(2)$
(a) $\pi/6$
(b) $\pi/3$
(c) $2\pi/3$
(d) $5\pi/6$
Question 36. $\tan^{-1}(\sqrt{3})$
(a) $\pi/6$
(b) $\pi/3$
(c) $2\pi/3$
(d) $5\pi/6$
Question 37. $\cot^{-1}(-\sqrt{3})$
(a) $5\pi/6$
(b) $\pi/3$
(c) $\pi/2$
(d) $\pi/4$
Question 38. $\tan^{-1}(\sqrt{3}) + \sec^{-1}(-2) - \text{cosec}^{-1}(2/\sqrt{3})$
(a) $5\pi/6$
(b) $2\pi/3$
(c) $\pi/3$
(d) 0
Question 39. $\cos^{-1}(-1/2) + 2\sin^{-1}(-1/2)$
(a) $\pi/3$
(b) $2\pi/3$
(c) $3\pi/4$
(d) $5\pi/8$

CASE STUDY QUESTIONS

Case Study 1

A group of students of class XII visited India Gate on an education trip. The teacher and students had interest in history as well. The teacher narrated that India Gate, official name Delhi Memorial, originally called All-India War Memorial, monumental sandstone arch in New Delhi, dedicated to the troops of British India who died in wars fought between 1914 and 1919. The teacher also said that India Gate, which is located at the eastern end of the Raj path (formerly called the Kingsway), is about 138 feet (42 metrs) in height.

1. What is the angle of elevation if they are standing at a distance of 42m away from the monument?

a) $\tan^{-1} 1$
b) $\sin^{-1} 1$
c) $\cos^{-1} 1$
d) $\sec^{-1} 1$

2. They want to see the tower at an angle of $\sec^{-1} 2$**. So, they want to know the distance where they should stand and hence find the distance.**

a) 42 m b) 20.12 m c) 25.24 m d) 24.64 m

3. If the altitude of the Sun is at $\cos^{-1} \frac{1}{2}$**, then the height of the vertical tower that will cast a shadow of length 20 m is**

a) 20√3 m b) 20/ √3 m c) 15/ √3 m d) 15√3 m

4. The ratio of the length of a rod and its shadow is 1:2. The angle of elevation of the Sun is

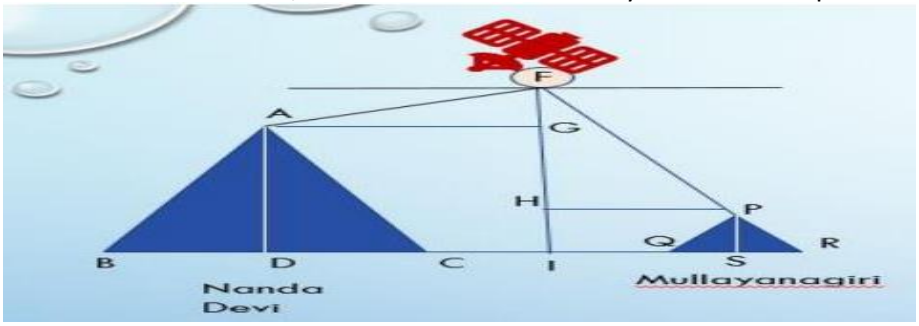
a) $\sin^{-1} \frac{1}{2}$ **b)** $\cos^{-1} \frac{1}{2}$ **c)** $\tan^{-1} \frac{1}{2}$ **d)** $\cot^{-1} \frac{1}{2}$

5. Domain of $\sin^{-1} x$ **is……..**

a) (-1, 1) b) {-1,1} c) [-1,1] d) none of these

Case Study 2

A Satellite flying at height h is watching the top of the two tallest mountains in Uttarakhand and Karnataka, them being Nanda Devi (height 7,816m) and Mullayanagiri (height 1,930 m). The angles of depression from the satellite, to the top of Nanda Devi and Mullayanagiri are $\cot^{-1} \sqrt{3}$ and$\tan^{-1} \sqrt{3}$ respectively. If the distance between the peaks of the two mountains is 1937 km, and the satellite is vertically above the midpoint of the distance between the two mountains.



1. The distance of the satellite from the top of Nanda Devi is
a) 1139.4 kmb) 577.52 kmc) 1937 kmd) 1025.36 km
2. The distance of the satellite from the top of Mullayanagiri is
a) 1139.4 kmb) 577.52 kmc) 1937 kmd) 1025.36 km
3. The distance of the satellite from the ground is
a) 1139.4 kmb) 577.52 kmc) 1937 kmd) 1025.36 km
4. What is the angle of elevation if a man is standing at a distance of 7816m from Nanda Devi?
a) $\sec^{-1} 2$b) $\cot^{-1} 1$c) $\sin^{-1}\frac{\sqrt{3}}{2}$d) $\cos^{-1} 1$
5.If a mile stone very far away from, makes $\cos^{-1}\frac{1}{\sqrt{2}}$to the top of Mullanyangiri mountain. So, find the distance of this mile stone from the mountain.
a) 1118.327 kmb) 566.976 kmc) 1937 kmd) 1025.36 km

Case Study 3

The angles of depression of the top and the bottom of an 8 m tall building from the top of a multi-storeyed building are $\tan^{-1}\frac{1}{\sqrt{3}}$ and $\sec^{-1}\sqrt{2}$, respectively.

1 The height of the multi-storeyed building is
a) $4(3+\sqrt{3})$ m
b) $3(3+\sqrt{3})$ m
c) $4(4+\sqrt{3})$ m
d) $4(3+3\sqrt{3})$ m
2 The distance between the two buildings.
a) $4(13+\sqrt{3})$ m
b) $4(31+\sqrt{3})$ m
c) $2(3+\sqrt{3})$ m
d) $4(3+\sqrt{3})$ m
3 The value of $\tan^{-1}\frac{1}{\sqrt{3}}$ is
a) $\sin^{-1}\frac{1}{2}$ b) $\cos^{-1}\frac{1}{2}$ c) $\sec^{-1}\frac{1}{\sqrt{2}}$ d) $\csc^{-1}\sqrt{2}$
4. The value of $\sec^{-1}\sqrt{2}$ is
a) $\sin^{-1}\frac{1}{2}$ b) $\cos^{-1}\frac{1}{2}$ c) $\cos^{-1}\frac{1}{\sqrt{2}}$ d) $\sin^{-1}\frac{\sqrt{3}}{2}$
5. The range of $\cos^{-1} x$
a) $(0,\pi)$ b) $[0,\pi]$ c) $\{0,\pi\}$ d) $(0,\pi]$

ASSERTION AND REASON

Read Assertion and reason carefully and write correct option for each question

(a) Both A and R are correct; R is the correct explanation of A.
(b) Both A and R are correct; R is not the correct explanation of A.
(c) A is correct; R is incorrect.
(d) R is correct; A is incorrect.

1. **Assertion (A)**Domain of $\sin^{-1}x$ is $(-1,1)$

Reason(R) The value of $\sin^{-1}\frac{1}{2}=\frac{\pi}{6}$ is

2. **Assertion (A)**Range of $\sin^{-1}x$ is $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$

Reason(R) The principal value of $\sin^{-1}\frac{1}{2}=\frac{\pi}{6}$

3. **Assertion (A)**The principal value of $\cot^{-1}\frac{1}{\sqrt{3}}=\frac{\pi}{6}$

Reason(R) Range of principal value branch of $\cot^{-1}x$ is $(0,\pi)$

4. **Assertion (A)**The principal value of $\tan^{-1}\frac{1}{\sqrt{3}}=\frac{\pi}{6}$

Reason(R) Range of principal value branch of $\tan^{-1}x$ is $(0,\pi)$

5. **Assertion (A)**The principal value of $\cos^{-1}\frac{1}{2}=\frac{\pi}{3}$

Reason(R) Range of principal value branch of $\cos^{-1}x$ is $[0,\pi]$

6. **Assertion (A)**The principal value of $\cos^{-1}\frac{1}{\sqrt{2}}=\frac{\pi}{4}$

Reason(R) Range of principal value branch of $\cot^{-1}x$ is $[0,\pi]$

7. **Assertion (A)** The principal value of $\cos^{-1}-\frac{1}{\sqrt{2}}=\frac{3\pi}{4}$

Reason(R) Range of principal value branch of $\cos^{-1}x$ is $[0,\pi]$

8. **Assertion (A)**Range of principal value branch of $\cot^{-1}x$ is $(0,\pi)$

Reason(R) Domain of $\sin^{-1}x$ is $(-1,1)$

9. **Assertion (A)**$\frac{1}{\sin x}\neq \sin^{-1}x$

Reason (R) $\frac{1}{\sin x}=(\sin x)^{-1}$

10. **Assertion (A)** The principal value of $\cos^{-1}-\frac{\sqrt{3}}{2}=\frac{5\pi}{6}$

Reason(R) Range of principal value branch of $\cos^{-1}x$ is $[-\pi,\pi]$

MATRICES

MULTIPLE CHOICE QUESTIONS

1.If $\begin{bmatrix}x & 1\end{bmatrix}\begin{bmatrix}1 & 0\\ -2 & 0\end{bmatrix}=0$, then x equals

(a) 0
(b) -2
(c) -1
(d) 2

2.If $A=\begin{bmatrix}2 & -3 & 4\end{bmatrix}$, $B=\begin{bmatrix}3\\2\\2\end{bmatrix}$, $X=\begin{bmatrix}1 & 2 & 3\end{bmatrix}$and $Y=\begin{bmatrix}2\\3\\4\end{bmatrix}$, then AB+XY equals

(a) $[28]$
(b) $[24]$
(c) 28
(d) 24

3. Which of the given value of x and y make the following matrices equal

$\begin{bmatrix}3x+7 & 5\\ y+1 & 2-3x\end{bmatrix},\begin{bmatrix}0 & y-2\\ 8 & 4\end{bmatrix}$

(a) x=$\frac{-1}{2}$, y=7

(b) Not possible to find

(c) x=$\frac{-2}{3}$, y=7

(d) x=$\frac{-1}{3}$, y= $\frac{-2}{3}$

4. The number of all possible matrices of order 3x3 with each entry 0 or 1 is:

(a) 27

(b) 18

(c) 81

(d) 512

5. If $\mathrm{A} = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$, and $\mathrm{A} + \mathrm{A}' = \mathrm{I}$, then the value of α is

(a)$\frac{\pi}{6}$

(b) $\frac{\pi}{3}$

(c)π

(d) $\frac{3\pi}{2}$

6. Matrix A and B will be inverse of each other only if

(a) AB=BA

(b) AB=BA=0

(c) AB=0, BA=I

(d) AB=BA=I

7. The matrix $\mathrm{P} = \begin{bmatrix} 0 & 0 & 4 \\ 0 & 4 & 0 \\ 4 & 0 & 0 \end{bmatrix}$ is a

(a) square matrix

(b) diagonal matrix

(c) unit matrix

(d) None of these

8. If A and B are symmetric matrices of same order, then AB-BA is a

(a) Skew-symmetric matrix

(b) Symmetric matrix

(c) Zero matrix

(d) Identity

9. The matrix $\begin{bmatrix} 0 & -5 & 8 \\ 5 & 0 & 17 \\ -8 & -17 & 0 \end{bmatrix}$ is a

(a) Diagonal matrix

(b) Skew-symmetric matrix

(c) Symmetric matrix

(d) Scalar matrix

10. If a matrix has 6 elements, then number of possible orders of the matrix can be

(a) 2

(b) 4

(c) 3

(d) 6

11. If A = $[a_{ij}]$ is a 2 × 3 matrix, such that $a_{ij} = \frac{(-i+2j)^2}{5}$ then a_{23} is

(a) $\frac{1}{5}$

(b) $\frac{2}{5}$

(c) $\frac{9}{5}$

(d) $\frac{16}{5}$

12. Total number of possible matrices of order 2 × 3 with each entry 1 or 0 is
(a) 6
(b) 36
(c) 32
(d) 64
13. If A is a square matrix such that $A^2 = A$, then $(I + A)^2 - 3A$ is
(a) I
(b) 2A
(c) 3I
(d) A
14. If $A=\begin{bmatrix}0 & 2\\ 2 & 0\end{bmatrix}$, then A^2 is
(a) $\begin{bmatrix}0 & 4\\ 4 & 0\end{bmatrix}$
(b) $\begin{bmatrix}4 & 0\\ 4 & 0\end{bmatrix}$
(c) $\begin{bmatrix}0 & 4\\ 0 & 4\end{bmatrix}$
(d) $\begin{bmatrix}4 & 0\\ 0 & 4\end{bmatrix}$
15. The diagonal elements of a skew symmetric matrix are
(a) all zeroes
(b) are all equal to some scalar k(≠ 0)
(c) can be any number
(d) none of these
16. If $A =\begin{bmatrix}5 & x\\ y & 0\end{bmatrix}$ and A = A′ then
(a) x = 0, y = 5
(b) x = y
(c) x + y = 5
(d) x – y = 5
17. If a matrix A is both symmetric and skew symmetric then matrix A is
(a) a scalar matrix
(b) a diagonal matrix
(c) a zero matrix of order n × n
(d) a rectangular matrix.
18. If $F(x) =\begin{bmatrix}\cos x & \sin x\\ -\sin x & \cos x\end{bmatrix}$, then F(x) F(y) is equal to
(a) F(x)
(b) F(xy)
(c) F(x + y)
(d) F(x – y)
19. The matrix A satisfies the equation $\begin{bmatrix}0 & 2\\ -1 & 1\end{bmatrix}A = \begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ then
(a) $\begin{bmatrix}2 & 0\\ 1 & -1\end{bmatrix}$
(b) $\begin{bmatrix}1 & -2\\ 1 & 0\end{bmatrix}$
(c) $\begin{bmatrix}\frac{1}{2} & -1\\ \frac{1}{2} & 0\end{bmatrix}$
(d) $\begin{bmatrix}1 & 2\\ -1 & 4\end{bmatrix}$

20. The matrix A=$\begin{bmatrix}0 & 0 & 1\\0 & 1 & 0\\1 & 0 & 0\end{bmatrix}$, then $A^6$is equal to

(a) zero matrix

(b) A

(c) I

(d) none of these

21. If A= $\begin{bmatrix}3 & 1\\-1 & 2\end{bmatrix}$, then $A^2 - 5A - 7I$ is

(a) a zero matrix

(b) an identity matrix

(c) diagonal matrix

(d) none of these

22. A matrix has 18 elements, then possible number of orders of a matrix are

(a) 3 (b) 4 (c) 6 (d) 5

23. If matrix A is of order m × n, and for matrix B, AB and BA both are defined, then order of matrix B is

(a) m × n

(b) n × n

(c) m × m

(d) n × m

24. The matrix $\begin{bmatrix}2 & -1 & 4\\1 & 0 & -5\\-4 & 5 & 7\end{bmatrix}$ is

(a) a symmetric matrix

(b) a skew-symmetric matrix

(c) a diagonal matrix

(d) none of these

25. If A =$\begin{bmatrix}3 & -2\\4 & -2\end{bmatrix}$, then the value of k if, $A^2 = kA - 2I$ is

(a) 0

(b) 8

(c) – 7

(d) 1

CASE STUDY QUESTIONS

1.A manufacture produces three stationery products Pencil, Eraser and Sharpener which he sells in two markets.

Annual sales are indicated below

Market	Products (in numbers)		
	Pencil	Eraser	Sharpener
A	10,000	2000	18,000
B	6000	20,000	8,000

If the unit Sale price of Pencil, Eraser and Sharpener are ₹ 2.50, ₹ 1.50 and ₹ 1.00 respectively, and unit cost of the above three commodities are ₹ 2.00, ₹ 1.00 and ₹ 0.50 respectively, then, based on the above information answer the following:

(a) Total revenue of market A

(i) ₹ 64,000

(ii) ₹ 60,400

(iii) ₹ 46,000

(iv) ₹ 40,600

(b) Total revenue of market B

(i) ₹ 35,000

(ii) ₹ 53,000

(iii) ₹ 50,300

(iv) ₹ 30,500

(c) Cost incurred in market A

(i) ₹ 13,000

(ii) ₹ 30,100

(iii) ₹ 10,300

(iv) ₹ 31,000

(d) Profit in market A and B respectively are

(i) (₹ 15,000, ₹ 17,000)

(ii) (₹ 17,000, ₹ 15,000)

(iii) (₹ 51,000, ₹ 71,000)

(iv) (₹ 10,000, ₹ 20,000)

(e) Gross profit in both market

(i) ₹ 23,000

(ii) ₹ 20,300

(iii) ₹ 32,000

(iv) ₹ 30,200

2. Amit, Biraj and Chirag were given the task of creating a square matrix of order 2. Below are the matrices created by them. A, B, C are the matrices created by Amit, Biraj and Chirag respectively.

$$A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix} \; B = \begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix} \; C = \begin{bmatrix} 2 & 0 \\ 1 & -2 \end{bmatrix}$$

If a = 4 and b = −2, based on the above information answer the following:

(a) Sum of the matrices A, B and C, A + (B + C) is

(i) $\begin{bmatrix} 1 & 6 \\ 2 & 7 \end{bmatrix}$

(ii) $\begin{bmatrix} 6 & 1 \\ 7 & 2 \end{bmatrix}$

(iii) $\begin{bmatrix} 7 & 2 \\ 1 & 6 \end{bmatrix}$

(iv) $\begin{bmatrix} 2 & 1 \\ 7 & 6 \end{bmatrix}$

(b) $(A^T)^T$ is equal to

(i) $\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$

(ii) $\begin{bmatrix} 2 & 1 \\ 3 & -1 \end{bmatrix}$

(iii) $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$

(iv) $\begin{bmatrix} 2 & 3 \\ -1 & 1 \end{bmatrix}$

(c) $(bA)^T$ is equal to

(i) $\begin{bmatrix} -2 & -4 \\ 2 & -6 \end{bmatrix}$

(ii) $\begin{bmatrix} -2 & 2 \\ -4 & -6 \end{bmatrix}$

(iii) $\begin{bmatrix} -2 & 2 \\ -6 & -4 \end{bmatrix}$

(iv) $\begin{bmatrix} -6 & -2 \\ 2 & 4 \end{bmatrix}$

(d) AC − BC is equal to

(i) $\begin{bmatrix} -4 & -6 \\ -4 & 4 \end{bmatrix}$

(ii) $\begin{bmatrix} -4 & -4 \\ 4 & -6 \end{bmatrix}$

(iii) $\begin{bmatrix} -4 & -4 \\ -6 & 4 \end{bmatrix}$

(iv) $\begin{bmatrix} -6 & 4 \\ -4 & -4 \end{bmatrix}$

(e) (a + b)B is equal to

(i) $\begin{bmatrix} 0 & 8 \\ 10 & 2 \end{bmatrix}$

(ii) $\begin{bmatrix} 2 & 10 \\ 8 & 0 \end{bmatrix}$

(iii) $\begin{bmatrix} 8 & 0 \\ 2 & 10 \end{bmatrix}$

(iv) $\begin{bmatrix} 2 & 0 \\ 8 & 10 \end{bmatrix}$

3. Two farmers Ramakishan and Gurucharan Singh cultivate only three varieties of rice namely Basmati, Permal and Naura. The sale (in rupees) of these varieties of rice by both the farmers in the month of September and October are given by the following matrices A and B.

September sales (in Rupees) $A = \begin{bmatrix} 10{,}000 & 20{,}000 & 30{,}000 \\ 50{,}000 & 30{,}000 & 10{,}000 \end{bmatrix}$ Ramakishan / Gurucharan

October sales (in Rupees) $B = \begin{bmatrix} 5{,}000 & 10{,}000 & 6{,}000 \\ 20{,}000 & 10{,}000 & 10{,}000 \end{bmatrix}$ Ramakishan / Gurucharan

(a) The total sales in September and October for each farmer in each variety can be represented as

(i) A + B

(ii) A – B

(iii) A > B

(iv) A < B

(b) What is the value of A_{23}?

(i) 10000

(ii) 20000

(iii) 30000

(iv) 40000

(c) The decrease in sales from September to October is given by _____.

(i) A + B

(ii) A – B

(iii) A > B
(iv) A < B

(d) If Ramkishan receives 2% profit on gross sales, compute his profit for each variety sold in October.

(i) ₹ 100, ₹ 200 and ₹ 120
(ii) ₹ 100, ₹ 200 and ₹ 130
(iii) ₹ 100, ₹ 220 and ₹ 120
(iv) ₹ 110, ₹ 200 and ₹ 120

(e) If Gurucharan receives 2% profit on gross sales, compute his profit for each variety sold in September.

(i) ₹ 100, ₹ 200, ₹ 120
(ii) ₹ 1000, ₹ 600, ₹ 200
(iii) ₹ 400, ₹ 200, ₹ 120
(iv) ₹ 1200, ₹ 200, ₹ 120

4. Assume the following data regarding the number of USB cables and their types manufactured in the company I, II and III per day.

	Type A	Type B	Type C
I	40	30	50
II	20	80	10
III	40	60	5

(a) How the above information can be represented in a square matrix of 3 × 3?

(i) $\begin{bmatrix} 40 & 30 & 50 \\ 40 & 60 & 5 \\ 20 & 80 & 10 \end{bmatrix}$

(ii) $\begin{bmatrix} 40 & 30 & 50 \\ 20 & 80 & 10 \\ 40 & 60 & 5 \end{bmatrix}$

(iii) $\begin{bmatrix} 40 & 20 & 40 \\ 30 & 80 & 60 \\ 50 & 10 & 5 \end{bmatrix}$

(iv) $\begin{bmatrix} 30 & 40 & 50 \\ 80 & 20 & 10 \\ 60 & 40 & 5 \end{bmatrix}$

(b) What does the element of 3rd row and 3rd column represents?

(i) Number of USB type 'C' = 5 Produced by company = III
(ii) Number of USB type 'C' = 50 Produced by company = III
(iii) Number of USB type 'C' = 40 Produced by company = III
(iv) Number of USB type 'C' = 5 Produced by company = I

(c) How many USB cables are produced by company I in 3 days?

(i) 120
(ii) 360
(iii) 90

(iv) 150

(d) How many USB cables are produced by all the companies in 2 days?

(i) 670

(ii) 560

(iii) 870

(iv) 1050

(e) How many USB cables of C-type are produced by company II?

(i) 10

(ii) 5

(iii) 50

(iv) 60

ASSERTION AND REASON

1. In the following questions, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** Mark the correct choice as.

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true but R is not the correct explanation of A

(C) A is true but R is false

(D) A is False and R is True.

i)Assertion (A) : If A is a square matrix such that $A^2 = A$, then $(I + A)^2 - 3A = I$

Reason (R) : $AI = IA = A$

Ii)Assertion (A) : $\begin{bmatrix} 7 & 0 & 0 \\ 0 & 7 & 0 \\ 0 & 0 & 7 \end{bmatrix}$ is a scalar matrix .

Reason (R) : If all the elements of the principal diagonal are equal , it is called a scalar matrix.

iii)Assertion (A) : $(A + B)^2 \neq A^2 + 2AB + B^2$

Reason (R) : Generally $AB \neq BA$

iv) A and B are two matrices such that AB and BA are defined

Assertion (A) : $(A + B)(A - B) = A^2 - B^2$

Reason (R) : $(A + B)(A - B) = A^2 - AB + BA - B^2$

v) Let A and B be the two symmetric matrices of order 3

Assertion (A) : A(BA) and (AB)A are symmetric matrices

Reason (R) : AB is symmetric matrix if matrix multiplication of A with B is commutative .

vi)Assertion (A) : If the matrix $P = \begin{bmatrix} 0 & 2b & -2 \\ 3 & 1 & 3 \\ 3a & 3 & 3 \end{bmatrix}$ is a symmetric matrix ,

then $a = \frac{-2}{3}$ and $b = \frac{3}{2}$

Reason (R) : If P is a symmetric matrix , Then $P' = -P$

vii)Assertion (A) : If A is a symmetric matrix, then $B'AB$ is also symmetric

Reason (R) : $(ABC)' = C'B'A'$

viii)Assertion (A) : If A and B are symmetric matrices , then $AB - BA$ is a skew-symmetric matrix.

Reason (R) : $(AB)' = B'A'$

DETERMINANTS

MULTIPLE CHOICE QUESTIONS

1. If A is a square matrix of order 3, such that $A(\text{adj}A) = 10I$, then $|\text{adj } A|$ is equal to
(a) 1
(b) 10
(c) 100
(d) 1000

2. Let $\Delta = \begin{vmatrix} Ax^2 & x^3 & 1 \\ By^2 & y^3 & 1 \\ Cz^2 & z^3 & 1 \end{vmatrix}$ and $\Delta_1 = \begin{vmatrix} Ax & By & Cz \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix}$ then

(a) $\Delta + \Delta_1 = 0$
(b) $\Delta \neq \Delta_1$
(c) $\Delta = x\Delta_1$
(d) $\Delta - \Delta_1 = 0$

3. Let A be a square matrix of order 2 × 2, then |KA| is equal to
(a) K|A| (b) $K^2|A|$ (c) $K^3|A|$ (d) 2K|A|

4. If $\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$ and A_{ij} is cofactor of a_{ij}, then the value of Δ is given by (a) $a_{11}A_{31} + a_{12}A_{32} + a_{13}A_{33}$
(b) $a_{11}A_{11} + a_{12}A_{21} + a_{13}A_{31}$
(c) $a_{21}A_{11} + a_{22}A_{12} + a_{23}A_{13}$
(d) $a_{11}A_{11} + a_{21}A_{21} + a_{31}A_{31}$

5. If A and B are invertible matrices then which of the following is not correct
(a) Adj A = $|A|.A^{-1}$
(b) $\det(A^{-1}) = (\det A)^{-1}$
(c) $(AB)^{-1} = B^{-1}A^{-1}$
(d) $(A + B)^{-1} = A^{-1} + B^{-1}$

6. Let A be a non-angular square matrix of order 3 × 3, then |A . adj A| is equal to
(a) $|A|^3$
(b) $|A|^2$
(c) |A|
(d) 3|A|

7. Let A be a square matrix of order 3 × 3 and k a scalar, then |kA| is equal to
(a) k |A|
(b) |k| |A|
(c) k^3 |A|
(d) none of these

8. If a, b, c are all distinct, and $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$ = 0, then the value of abc is
(a) 0
(b) –1
(c) 3
(d) –3

9. If a, b, c are in AP, then the value of $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix}$ is
(a) 4
(b) –3

(c) 0
(d) abc

10. If A is a skew-symmetric matrix of order 3, then the value of $|A|$ is
(a) 3
(b) 0
(c) 9
(d) 27

11. If $\begin{vmatrix} 2 & 3 & 2 \\ x & x & x \\ 4 & 9 & 1 \end{vmatrix} + 3 = 0$, then the value of x is
(a) 3
(b) 0
(c) -1
(d) 1

12. Let $A = \begin{bmatrix} 200 & 50 \\ 10 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 50 & 40 \\ 2 & 3 \end{bmatrix}$, then $|AB|$ is equal to
(a) 460
(b) 200
(c) 3000
(d) -7000

13. If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then $\det(\text{adj } A)$ equals
(a) a^{27}
(b) a^9
(c) a^6
(d) a^2

14. If A is any square matrix of order 3x3 such that $|A| = 3$, then the value of $|\text{adj } A|$ is
(a)3
(b)$\frac{1}{3}$
(c) 9
(d) 27

15. If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, then the value of x is
(a) 3
(b) ± 3
(c) ± 6
(d) 6

16. The area of a triangle with vertices $(-3,0), (3,0) \text{and } (0,k)$ is 9 sq. units. Then, the value of k will be
(a) 9
(b) 3
(c) -9
(d) 6

17. If A and B are invertible matrices, then which of the following is not correct?
(a) $\text{adj } A = |A|.A^{-1}$
(b) $\det(A^{-1}) = (\det(A))^{-1}$
(c) $(AB)^{-1} = B^{-1}A^{-1}$
(d) $(A+B)^{-1} = B^{-1} + A^{-1}$

18. Adjoint of matrix $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ is
(a) $\begin{bmatrix} 4 & 2 \\ 3 & 1 \end{bmatrix}$
(b) $\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$

(c) $\begin{bmatrix}1 & 2\\3 & 4\end{bmatrix}$

(d) $\begin{bmatrix}1 & -2\\-3 & 4\end{bmatrix}$

19. If $A = \begin{bmatrix}2 & -3\\3 & 4\end{bmatrix}$, then A^{-1} will be

(a) $\frac{1}{17}\begin{bmatrix}2 & 3\\-3 & 4\end{bmatrix}$

(b) $\frac{1}{17}\begin{bmatrix}4 & 3\\-3 & 2\end{bmatrix}$

(c) $\frac{-1}{17}\begin{bmatrix}4 & 3\\-3 & 2\end{bmatrix}$

(d) $\frac{1}{17}\begin{bmatrix}4 & 3\\-3 & -2\end{bmatrix}$

20. For any square matrix A, AA^T is a

(a) Unit matrix

(b) Symmetric matrix

(c) Skew symmetric matrix

(d) Diagonal matrix

21. Which of the following is not true?

(a) Every skew-symmetric matrix of odd order is non-singular

(b) If determinant of a square matrix is non-zero, then it is non singular

(c) Adjoint of symmetric matrix is symmetric

(d) Adjoint of a diagonal matrix is diagonal

22. If a matrix A is such that $3A^3 + 2A^2 + 5A + I = 0$ then its inverse is

(a) $-(3A^2 + 2A + 5I)$

(b) $(3A^2 + 2A + 5I)$

(c) $(3A^2 - 2A + 5I)$

(d) None of these

23. If the order of matrix A is m x p and the order of B is p x n. Then the order of matrix AB is?

(a) m × n

(b) n × m

(c) n × p

(d) m × p

24. What is x if $\begin{bmatrix}1 & 4\\2 & x\end{bmatrix}$ is a singular matrix?

(a) 5

(b) 6

(c) 7

(d) 8

25. If $\begin{bmatrix}a & b\\c & d\\e & f\end{bmatrix} A = \begin{bmatrix}g & h & i\\j & k & l\\m & n & o\end{bmatrix}$ then order of matrix A is

(a) 2 x 2

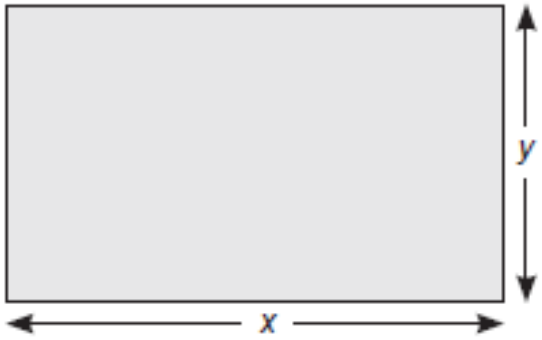
(b) 2 x 3

(c) 3 x 2

(d) 3 x 3

CASE STUDY QUESTIONS

1. Manjit wants to donate a rectangular plot of land for a school in his village. When he was asked to give dimensions of the plot, he told that if its length is decreased by 50 m and breadth is increased by 50 m, then its area will remain same, but if length is decreased by 10 m and breadth is decreased by 20 m, then its area will decrease by 5300 m^2.



information given above, answer the following questions:

(a) The equations in terms of X and Y are

(i) x – y = 50, 2x – y = 550

(ii) x – y = 50, 2x + y = 550

(iii) x + y = 50, 2x + y = 550

(iv) x + y = 50, 2x + y = 550

(b) Which of the following matrix equation is represented by the given information:

(i) $\begin{bmatrix}1 & -1\\ 2 & 1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix} = \begin{bmatrix}50\\ 550\end{bmatrix}$

(ii) $\begin{bmatrix}1 & 1\\ 2 & 1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix} = \begin{bmatrix}50\\ 550\end{bmatrix}$

(iii) $\begin{bmatrix}1 & 1\\ 2 & -1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix} = \begin{bmatrix}50\\ 550\end{bmatrix}$

(iv) $\begin{bmatrix}1 & 1\\ 2 & 1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix} = \begin{bmatrix}-50\\ -550\end{bmatrix}$

(c) The value of x (length of rectangular field) is

(i) 150 m

(ii) 400 m

(iii) 200 m

(iv) 320 m

(d) The value of y (breadth of rectangular field) is

(i) 150 m

(ii) 200 m

(iii) 430 m

(iv) 350 m

(e) How much is the area of rectangular field?

(i) 60000 sq m.

(ii) 30000 sq m.

(iii) 30000 m

(iv) 3000 m

2. Raja purchases 3 pens, 2 pencils and 1 mathematics instrument box and pays ₹ 41 to the shopkeeper. His friends, Daya and Anil purchases 2 pens, 1 pencil, 2 instrument boxes and 2 pens, 2 pencils and 2 mathematical instrument boxes respectively. Daya and Anil pays ₹ 29 and ₹ 44 respectively. Based on the above information answer the following:

(a) The cost of one pen is

(i) ₹ 2

(ii) ₹ 5

(iii) ₹ 10

(iv) ₹ 15

(b) The cost of one pen and one pencil is

(i) ₹ 5

(ii) ₹ 10

(iii) ₹ 15

(iv) ₹ 17

(c) The cost of one pen and one mathematical instrument box is
(i) ₹ 7
(ii) ₹ 10
(iii) ₹ 15
(iv) ₹ 18
(d) The cost of one pencil and one mathematical instrumental box is
(i) ₹ 5
(ii) ₹ 10
(iii) ₹ 15
(iv) ₹ 20
(e) The cost of one pen, one pencil and one mathematical instrumental box is
(i) ₹ 10
(ii) ₹ 15
(iii) ₹ 22
(iv) ₹ 25

3. The management committee of a residential colony decided to award some of its members (say x) for honesty, some (say y) for helping others and some others (say z) for supervising the workers to kept the colony neat and clean. The sum of all theawardees is 12. Three times the sum of awardees for cooperation and supervision added to two times the number of awardees for honesty is 33. The sum of the number of awardees for honesty and supervision is twice the number of awardeesfor helping.

(i) Value of $x + y + z$ is
(a) 3
(b) 5
(c) 7
(d) 12
(ii) Value of $x - 2y$ is
(a) z
(b) -z
(c) 2z
(d) -2z
(iii) The value of z is
(a) 3
(b) 4
(c) 5
(d) 6
(iv) The value of $x + 2y$ is
(a) 9
(b) 10
(c) 11
(d) 12

(v) The value of $2x + 3y + 5z$ is
(a) 40
(b) 43
(c) 50
(d) 53

4. Read the following text and answer the following questions on the basis of the same:

Two schools Oxford and Navdeep want to award their selected students on the values of sincerity, truthfulness and helpfulness. Oxford wants to award Ex each, y each and z each for the three respective values to 3,2 and 1 students respectively with a total award money of 1600. Navdeep wants to spend 2300 to award its 4, 1 and 3 students on the respective values (by giving the same amount to the three values as before). The total amount of the award for one prize on each is ₹900.

(i) Value of $x + y + z$ is
(a) 800
(b) 900
(c) 1000
(d) 1200

(ii) Value of $4x + y + 3z$ is
(a) 1600
(b) 2300
(c) 900
(d) 1200

(iii) The value of y is
(a) 200
(b) 250
(c) 300
(d) 350

(iv) The value of $2x + 3y = \cdots \ldots \ldots \ldots$
(a) 1000
(b) 1100
(c) 1200
(d) 1300

(v) The value of $y - x = \cdots \ldots \ldots \ldots \ldots$
(a) 100
(b) 200
(c) 300
(d) 400

ASSERTION AND REASON

1.In the following questions, A statement of Assertion (A) is followed by a statement of **Reason (R).**
Mark the correct choice as.

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true but R is not the correct explanation of A

(C) A is true but R is false

(D) A is False and R is True.

i)Let A be a 2×2 matrix

Assertion (A): adj (adj A) = A

Reason (R) :$|\text{adj } A| = |A|$

ii)Assertion (A) : if $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$, then $A^{-1} = \begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{4} \end{bmatrix}$

Reason (R): The inverse of an invertible diagonal matrix is a diagonal matrix.

iii)Assertion (A) : if every element of a third order determinant of value Δ is multiplied by 5 , then the value of new determinant is 125Δ

Reason (R) : If k is a scalar and A is an $n \times n$ matrix , then $|kA| = k^n|A|$

iv)Assertion (A) : If the matrix $A = \begin{bmatrix} 1 & 3 & \gamma + 2 \\ 2 & 4 & 8 \\ 3 & 5 & 10 \end{bmatrix}$ is singular , then $\gamma = 4$

Reason (R) : If A is a singular matrix , then $|A| = 0$

v) Given $A = \begin{bmatrix} 2 & -3 \\ -4 & 7 \end{bmatrix}$

Assertion (A) : $2A^{-1} = 9I - A$

Reason (R) : $A^{-1} = \frac{1}{|A|}(\text{adj}A)$

vi) Assertion (A) : If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ and $A^{-1} = kA$, then $k = \frac{1}{9}$

Reason(R): $|A^{-1}| = \frac{1}{|A|}$

vii) Consider the system of equations: $x + y + z = 2$, $2x + y - z = 3$
and $3x + 2y + kz = 4$

Assertion (A) : The system of equations has unique solution if $k \neq 0$

Reason(R): The system of equations has unique solution if $|A| = 1$

viii) Consider the system of equations: $x + 2y + 5z = 10$, $x - y - z = -2$ and $2x + 3y - z = -11$

Assertion(A) : The system of equations has unique solution if $x = -1$, $y = -2$ and $z = 3$

Reason(R): If $|A| = 0$ then the system of linear equations has no solutions.

CONTINUITY AND DIFFERENTIABILITY

MULTIPLE CHOICE QUESTIONS

Q1. If f(x) =2x and $g(x) = \frac{x^2}{2} + 1$ then which of the following can be a discontinuous function?

(A) F(x)+g(x) (B)f(x)-g(x) (C)f(x).g(x) (D)$\frac{f(x)}{g(x)}$

Q2. The function $f(x) = \frac{4-x^2}{4x-x^3}$ is

(A) Discontinuous at only one point (B)Discontinuous at only two point (C)Discontinuous at only three point (D)none of the above

Q3. The function $f(x) = e^{|x|}$ is

(A)Continuous everywhere but not differentiable at x=0

(B)Continuous and differentiable everywhere

(C)Not continuous at x=0

(D)None of the above

Q4. If $f(x) = x^2 \sin\left(\frac{1}{x}\right)$ where $x \neq 0$ then the value of the function f at x = 0, so that the function is continuous at x = 0 is

(A) 0 (B) -1 (C) 1 (D) none of these

Q5. The derivative of $cos^{-1}(2x^2 - 1)$ with respect to $cos^{-1}x$

(A) 2 (B)$\frac{-1}{2\sqrt{1-x^2}}$ (C) $\frac{2}{x}$ (D)$1 - x^2$

Q6. If $y = \sqrt{sinx + y}$,then $\frac{dy}{dx}$ is equal to

(A)$\frac{cosx}{2y-1}$ (B)$\frac{cosx}{1-2y}$ (C)$\frac{sinx}{1-2y}$ (D)$\frac{sinx}{2y-1}$

Q7.If $y = \log\left(\frac{1-x^2}{1+x^2}\right)$,then $\frac{dy}{dx}$ is equal to

(A)$\frac{4x^3}{1-x^4}$ (B)$\frac{-4x}{1-x^4}$ (C)$\frac{1}{1-x^4}$ (D)$\frac{-4x^3}{1-x^2}$

Q8. Find the value of p and q so that$f(x) = \begin{cases} x^2 + 3x + p & if \quad x \leq 1 \\ qx + 2 & if \quad x > 1 \end{cases}$ is differentiable at x = 1

(A) P=1 ,q=3 (B) p = 3 ,q = 5 (C) p=2 ,q = 4 (D) p = 3 ,q =6

Q9. Find the value of $\frac{dy}{dx}$ at $\theta = \frac{\pi}{3}$ if $x = asec^3\theta$ and $x = atan^3\theta$ is

(A) $\frac{\sqrt{3}}{2}$ (B)$-\frac{\sqrt{3}}{2}$ (C)$\frac{1}{2}$ (D)1

Q10. If $x^y = e^{x-y}$,then $\frac{dy}{dx}$ is

(A)$\frac{1+x}{1+logx}$ (B)$\frac{1-logx}{1+logx}$ (C)$\frac{x}{1+logx}$ (D)$\frac{x}{(1+logx)^2}$

Q11. Differential coefficient of $\sec(tan^{-1}x)$ is

(A)$\frac{x}{1+x^2}$ (B)$x\sqrt{1+x^2}$ (C)$\frac{x}{\sqrt{1+x^2}}$ (D)$\frac{1}{\sqrt{1+x^2}}$

Q12. If$\sin(x + y) = \log(x + y)$ then $\frac{dy}{dx}$ is

(A)2 (B) -2 (C)1 (D) -1

Q13. If $t = e^x$ and $y = t^2 - 1$ then $\frac{dy}{dx}$ at $t = 1$ is

(A)$\frac{1}{2e^2}$ (B)$\frac{1}{2}$ (C) 2 (D) $2e^2$

Q14. If $8f(x) + 6f\left(\frac{1}{x}\right) = x + 5$ and $y = x^2 f(x)$ then the value of $\frac{dy}{dx}$ at $x = -1$ is

(A)0 (B)$\frac{1}{14}$ (C) $\frac{-1}{14}$ (D) 1

Q15. If $= log\sqrt{tanx}$, then the value of $\frac{dy}{dx}$ at $x = \frac{\pi}{4}$ is

(A) ∞ (B) 1 (C) 0 (D)$\frac{1}{2}$

Q16. If $siny = \text{x}\cos(a + y)$ then $\frac{dy}{dx}$ is equal to

(A)$\frac{cos^2(a+y)}{cosa}$ (B)$\frac{cosa}{cos^2(a+y)}$ (C)$\frac{sin^2(a+y)}{cosa}$ (D)$\frac{cos^2(a+y)}{sina}$

Q17. If $y = tan^{-1}\left[\frac{sinx+cosx}{cosx-sinx}\right]$,then $\frac{dy}{dx}$ is equal to

(A)$\frac{1}{2}$ (B)0 (C) 1 (D) -1

Q18. If $y = sin^{-1}\left[\frac{1-x^2}{1+x^2}\right]\frac{dy}{dx}$ is equal to

(A)$\frac{-2}{1+x^2}$ (B)$\frac{2}{1+x^2}$ (C)$\frac{1}{2-x^2}$ (D)$\frac{2}{2-x^2}$

Q19. If $f(x) = \sqrt{x^2 + 6x + 9}$, then $f'(x)$ is equal to

(A)1 for $x < -3$(B)-1 for $x < -3$ (C)1 for all $x \in R$ (D)none of these

Q20. If $f(x) = |x^2 - 9x + 20|$, then $f'(x)$ is equal to

(A)-2x+9 for all x∈R (B)2x-9 if 4<x<5 (C)-2x+9 if 4<x<5 (D)none of these

Q21. If $f(x) = \sqrt{x^2 - 10x + 25}$, then the derivative of f(x) in the interval [0,7] is

(A)1 (B)-1 (C)0 (D)none of these

Q22. Derivative of $\sin x$ w.r.t $\cos x$ is

(A)$-\cot x$ (B)cot x (C) $\tan x$ (D)none of these

Q23. If $y = \log|3x|, x \neq 0$, then $\frac{dy}{dx}$ is

(A)$\frac{3}{x}$ (B)$\frac{1}{x}$ (C)$\frac{1}{3x}$ (D)none of these

Q24. If $|x|< 1$ and $y = 1 + x + x^2 + \cdots to\infty$, then $\frac{dy}{dx}$ is

(A)$\frac{1}{(1-x^2)^2}$ (B)$\frac{1}{(1+x^2)^2}$ (C)$(1 - x^2)^2$ (D)none of these

Q25. If $y = sec^{-1}\left(\frac{x+1}{x-1}\right) + sin^{-1}\left(\frac{x-1}{x+1}\right)$, then $\frac{dy}{dx}$ is

(A)0 (B)1 (C)-1 (D)none of these

Q26. If $y = \log\sqrt{\tan x}$, then $\frac{dy}{dx}$ is

(A)cos 2x (B)sin 2x (C)$cosec\ 2x$ (D)none of these

Q27. If $y = \sin(msin^{-1}x)$, then $(1 - x^2)y_2 - xy_1$ is equal to

(A)m^2y (B)my (C)$-m^2y$ (D)none of these

Q28. If $y = (sin^{-1}x)^2$, then $(1 - x^2)y_2$ is equal to

(A)$xy_1 + 2$ (B)$xy_1 - 2$ (C)$-xy_1 + 2$ (D)none of these

Q29. Find the value of k for which the function $f(x) = \begin{cases} \frac{x^2+3x-10}{x-2} & , \quad x \neq 2 \\ k & , \quad x = 2 \end{cases}$ is continuous at x = 2

(A)5 (B) 1 (C) 7 (D) 10

Q30. If $f(x) = \begin{cases} \frac{x^2-16}{x-4} & , \quad x \neq 4 \\ k & , \quad x = 4 \end{cases}$ is continuous at x = 4, find k

(A)3 (B) 5 (C)10 (D)8

CASE STUDY QUESTIONS

CASE STUDY-1

The relation between the height of the plant (y in cm) with respect to exposure to sunlight is governed by the equation y=4x-$\frac{1}{2}x^2$ where x is the number of days exposed to sunlight.

1. What will be the height of the plant after 2 days ?
    a. 4cm
    b. 6cm
    c. 8cm
    d. 10cm
2. For what value of x ,$\frac{dy}{dx}$ =0
    a. 3
    b. 4
    c. 5
    d. 2
3. For the value of x where $\frac{dy}{dx}$= 0 the height of the plant is maximum. What is the maximum height of the plant ?
    a. 4cm
    b. 6cm
    c. 8cm
    d. 10cm
4. What is the value of $\frac{d^2y}{dx^2}$ at x = 2 ?
    a. -2
    b. -4
    c. -5
    d. -1
5. If y = $e^x sinx$ what is $\frac{d^2y}{dx^2}$.
    a. $e^x(sinx$ +cosx)
    b. $2e^x cosx$
    c. $2\ e^x sinx$
    d. none of these

CASE STUDY-2

A potter made a mud vessel, where the the shape of the pot is based on f(x) = |x−3| + |x−2|, where f(x) represents height of the pot.

1. When x>4 what will be the height in terms of x?
    a. x-2

b. x-3

c. 2x-5

d. 5-2x

2. What is $\frac{dy}{dx}$ at x=3 ?

a. 2

b. -2

c. Function is not differentiable

d. 1

3. When the value of x lies between (2,3) then the function is

a. 2x-5

b.5-2x

c. 1

d. 5

4. If the potter is trying to make a pot using the function f(x)= [x] will he get a pot or not ?

a. Yes, because it is a continuous function

b. Yes, because it is not a continuous function

c. No, because it is a continuous function

d. No, because it is not a continuous function

5. What is the value of derivative of f(x) =[x] at the point x=8 ?

a. 1

b. f(x) is not differentiable at x=8

c. 0

d. none of these

CASE STUDY- 3

A manufacturer can sell x items at a price of rupees (5- $\frac{x}{100}$) each. The cost price of x items is rupees ($\frac{x}{5} + 500$) .

Then answer the followings:

1. What will be the value of selling price function S(x):

a. 5x + ($\frac{x^2}{100}$)

b. 10x + ($\frac{x^2}{100}$)

c. 5x - ($\frac{x^2}{100}$)

d. 10x - ($\frac{x^2}{100}$)

2. The value of profit function P(x) willbe:

a. ($\frac{24}{5}$)x +($\frac{x^2}{100}$) +500

b. ($\frac{24}{5}$)x +($\frac{x^2}{100}$) -500

c. ($\frac{24}{5}$)x -($\frac{x^2}{100}$)+ 500

d. ($\frac{24}{5}$)x -($\frac{x^2}{100}$) -500

3. The derivative of profit function P(x) is:

a. $\frac{24}{5} - \frac{x}{50}$

b. $\frac{24}{5} + \frac{x}{50}$

c. $-\frac{24}{5} - \frac{x}{50}$

d. $-\frac{24}{5} + \frac{x}{50}$

4. The second derivative of profit function P(x)

a. $\frac{1}{50}$

b. $\frac{-1}{50}$

c. 1

d. 0

5. For what value of P(x), P'(x) =0

a. 120

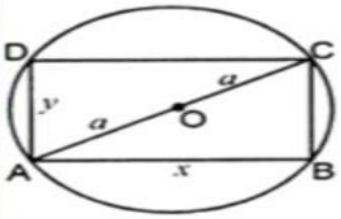
b. 60

c. 240

d. 24

CASE STUDY- 4

A gardener wants to construct a rectangular bed of garden in a circular patch of land. He takes the maximum perimeter of the rectangular region as possible. Refer the image. Radius of the circular patch of land is a.In the rectangular region he wants to plant flowers.



1. The perimeter function P(x) of rectangle is:

a. x+ $\sqrt{a^2 - x^2}$

b.2x+ $2\sqrt{a^2 - x^2}$

c.2x+2 $\sqrt{4a^2 - x^2}$

d. 4x+4 $\sqrt{a^2 - x^2}$

2. The area function A(x) of rectangle is:

a. $x\sqrt{a^2 - x^2}$

b. 2x$\sqrt{a^2 - x^2}$

c. 2x$\sqrt{4a^2 - x^2}$

d. $x\sqrt{4a^2 - x^2}$

3. The derivative of perimeter function P'(x) is :

a. $\frac{2(\sqrt{4a^2-x^2}-x)}{\sqrt{4a^2-x^2}}$

b. $\frac{\sqrt{4a^2-x^2}-x}{\sqrt{4a^2-x^2}}$

c. $\frac{2(\sqrt{a^2-x^2}-x)}{\sqrt{a^2-x^2}}$

d. $\frac{\sqrt{a^2-x^2}-x}{\sqrt{a^2-x^2}}$

4. The derivative of area function A'(x) is :

a. $\frac{2(a^2-x^2)}{\sqrt{4a^2-x^2}}$

b. $\frac{2(2a^2-x^2)}{\sqrt{4a^2-x^2}}$

c. $\frac{2(a^2-x^2)}{\sqrt{2a^2-x^2}}$

d. $\frac{a^2-x^2}{\sqrt{4a^2-x^2}}$

5. The value of x at which P'(x) =0 is

a. $\frac{a}{2}$

b. $\frac{a}{\sqrt{2}}$

c. 2a

$d.\sqrt{2}$ a

ASSERTION AND REASON

DIRECTION: In the following questions, a statement of assertion (A) is followed by a statement of reason (R) . Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

(e) Both Assertion (A) and reason (R) are false.

1. Assertion(A): f(x) = tan^2x is continuous at x= $\frac{\pi}{2}$.
   Reason(R):x^2 is continuous at x= $\frac{\pi}{2}$.
2. Assertion(A): f(x) = |sin x|is continuous for all x ∈ R
   Reason(R): sin x and |x| are continuous at on R.
3. Assertion(A): f(x) = |sin x|is continuous x=0.
   Reason(R): |sin x| is differentiable at x=0.
4. Consider the function f(x) = $f(x) = \begin{cases} \frac{kx}{|x|}, & x < 0 \\ 3x \geq 0 \end{cases}$ Which is continuous at x=0.

Assertion(A): The value of k is -3.

Reason(R):$|x| = \begin{cases} -x, & x < 0 \\ x, & x \geq 0 \end{cases}$

5. Consider the function$f(x) = \begin{cases} \frac{x^2+3x-10}{x-2}, & x \neq 2 \\ k, & x = 2 \end{cases}$Which is continuous at x=2.

Assertion(A): The value of k is 0.

Reason(R): f(x) is continuous at x=a if $\lim_{x \to a} f(x)$ = f(a).

6. Assertion(A): f(x) = [x] is not differentiable at x=2.
   Reason(R): f(x) = [x] is not continuous at x=2.
7. Assertion(A): A continuous funection is always differentiable.
   Reason(R): A differentiable function is always continuous.
8. Assertion(A): If x = t^2 and y = t^3 then $\frac{d^2y}{dx^2}$ = $\frac{3}{4t}$
   Reason(R):$\frac{d^2y}{dx^2}$ = $\frac{d}{dx}(\frac{dy}{dx})$ = $\frac{d}{dx}(\frac{3}{2}t)$=$\frac{3}{2}\frac{dt}{dx}$.
9. Assertion(A): If y = x^x then $\frac{dy}{dx}$ can be found by applying the formula of $\frac{d}{dx}(x^n)$ = n x^{n-1}
   Reason (R): Using logarithm the derivative of y= x^x can be found.
10. Assertion(A): If y = tan^5x then $\frac{dy}{dx}$ = 5 tan^4x
    Reason (R):$\frac{d}{dx}(x^n)$ = n x^{n-1}.
11. Assertion(A): If y= log $\sqrt{tanx}$, then the value of $\frac{dy}{dx}$ at x = $\frac{\pi}{4}$ is ∞.
    Reason (R): The value of log 1 is not defined.
12. Assertion(A): If $e^{x+y} = xy$ then $\frac{dy}{dx}$is $\frac{y(1-x)}{x(y-1)}$.
    Reason (R): The value of log e = 1

APPLICATION OF DERIVATIVES

MULTIPLE CHOICE QUESTIONS

Q. 1. The function $f(x) = \tan x - x$ is:

a) always increasing b) always decreasing

c) not always decreasing d) sometimes increasing and sometimes decreasing

Q. 2. The function $f(x) = x^3 - 6x^2 + 15x - 12$ is:

a) strictly decreasing on R b) strictly increasing on R

c) increasing on $(-\infty, 2]$ and decreasing on $(2, \infty)$ d) none of these

Q. 3. The function $f(x) = 4 - 3x + 3x^2 - x^3$is:

a) decreasing on R b) increasing on R c) strictly decreasing on R d) strictly increasing on R

Q. 4. The function $f(x) = \frac{x}{\sin x}$ is:

a) increasing in $(0, 1)$ b) decreasing in $(0, 1)$

c) increasing in $(0, \frac{1}{2})$ and decreasing in $(\frac{1}{2}, 0)$ d) none of these

Q. 5. Is the function $f(x) = \cos(2x + \frac{\pi}{4})$; is increasing or decreasing in the interval $(\frac{3\pi}{8}, \frac{7\pi}{8})$

a) increasing b) decreasing c) neither increasing nor decreasing d) none of these

Q. 6. The function $f(x) = x^x$ is decreasing in the interval:

a) $(0, e)$ b) $[0, \frac{1}{e})$ c)) $(0, 1)$ d) none of these

Q. 7. The function $f(x) = [x(x-3)]^2$ is increasing in :

a) $(0, \infty)$ b) $(-\infty, 0)$ c) $(1, 3)$ d) $[0, 1.5] \cup (3, \infty)$

Q. 8. The function $f(x) = \frac{x}{x^2+1}$ is increasing in :

a) $(-1, 1)$ b) $(-1, \infty)$ c) $(-\infty, -1) \cup (1, \infty)$ d) none of these

Q.9. Which of the following functions are strictly decreasing on $(0, \frac{\pi}{2})$

(a) Cos x (b) tan 2x (c) Cos 3x (d) tan x

Q.10. The least value of a such that f(x) = x^2 + ax +1 is strictly increasing on (1 , 2) is

(a) - 2 (b) -4 (c) 2 (d) 4

Q. 11. The two curves $x^3 - 3xy^2 + 2 = 0$ and $3x^2y^2 - y^3 = 2$

(a) Touch each other (c) Cut at an angle π/3

(b) Cut at right angle (d) Cut at an angle π/4

Q. 12.The tangent to the curve given by x = e^t.cos t, y =e^t.sin t at t = π/4 makes with x-axis an angle

(a) 0 (b) π/4 (c) π/3 (d) π/2

Q. 13. The equation of the normal to the curve y = sin x at (0, 0) is

(a) x = 0 (b) y = 0 (c) x + y = 0 (d) x – y = 0

Q.14. The point on the curve y^2 = x, where the tangent makes an angle of π/4 with x-axis is

(a) (½, ¼) (b) (¼ , ½) (c) (4, 2) (d) (1, 1)

Q.15. The slope of normal to the curve $y = 2x^2 + 3\sin x$ at $x = 0$ is

(a) -1/3 (b) ½ (c) 1/3 (d) 3

Q. 16. The line y = x + 1 is a tangent to the curve y^2 = 4x at the point

(a) (1, 2) (b) (2 , 1) (-1, 2) (d) (-1 , -2)

Q. 17. The equation of the normal to the curve $3x^2 - y^2 = 8$ which is parallel to the line $x + 3y = 8$ is

(a) $x + 3y = 8$ (b) $x + 3y + 8 = 0$ (c) $x + 3y \pm 8 = 0$ (d) None of These

Q. 18. The tangent to the curve $y = e^{2x}$ at the point (0, 1) meets x-axis at

(a) $(\frac{-1}{2}, 0)$ (b) $(\frac{1}{2}, 0)$ (c) $(\frac{2}{3}, 0)$ (d) None these

Q..19. The slope of tangent to the curve $x = t^2 + 3t - 8$ and $y = 2t^2 - 2t - 5$at t = 2 is

(a) 7/6 (b) 6/7 (c) -7/6 (d) -6/7

Q.20. The abscissaof the point on the curve $3y = 6x - 5x^3$, the normal at which passes through the origin is

(a) 1 (b) 2 (,c) -1 (d) -2

Q. 21 The Equation normal to the curve y=x+ Sinx + Cosx at x=$\frac{\pi}{2}$ is

a) x = 2 b) x = π c) x + π = 0 d) 2$x = \pi$

Q.22 The Point on the curve $y = x^2 - 3x + 2$ where tangent is perpendicular to y=x is

a) (½ , ¼) b) (¼ , ½) c) (4 , 2) d) (1 ,1)

Q.23 The point on the curve $y^2 = x$ where tangent makes 45^0 angle with x-axis is

(a) $(0,0)$ (b) $(2,16)$ (c) $(3, 9)$ (d) none of these

Q.24 The angle between the curves $y^2 = x$ and $x^2 = y$ at $(1,1)$is:

(a) $\tan^{-1}\frac{4}{3}$ (b) $\tan^{-1}\frac{3}{4}$ (c) 90^0 (d) 45^0

Q.25 At what point the slope of the tangent to the curve x^2+y^2-2x-3 is zero?

a) $(3, 0), (-1, 0)$ (b)(3,0),(1,2) (c) $(-1, 0),(1,2)$ (d) $(1, 2),(1, -2)$

Q.26 If the curve $ay + x^2 = 7$ and $x^3 = y$ cut each other at 90^0 at (1 , 1) , then value of a is :

a) 1 b) -6 c) 6 d) 0

Q.27 The equation of normal $x = a\cos^3\theta$, $y=a \sin^3\theta$ at the point $\theta = \pi/4$ is

a) x = 0 b) y = 0 c) x = y d) x + y = a

Q.28 The angle of intersection of the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ at the origin is

a) $\pi/6$ b) $\pi/3$ c) $\pi/2$ d) $\pi/4$

Q.29. The line y = x+1 touches $y^2=4x$ at the point

a) (1 , 2) b) (2 , 1) c) (1 ,-2) d) (-1 , 2)

Q.30 The tangent to the curve $y = e^{2x}$ at the point (0 , 1) meets x-axix at

a) (0 , 1) b) [-1/2 , 0] c) (2 , 0) d) (0 ,2)

Q.31 The Curve $y = 4x^2 + 2x - 8$ and $y = x^3 - x + 13$ touch each other at the point

a) (3 , 23) b) (23 , -3) c) (34 , 3) d) (3 , 34)

Q.32 The Maximum value of f(x) =$\frac{logx}{x}$is

a) 1/e b) 2/e c) e d) 1

Q.33 The maximum value of $x^2+\frac{250}{x}$ is

a) 0 b) 25 c) 50 d) 75

Q.34 The equation of tangent at those points where the curve $y = x^2 - 3x + 2$ meets x- axis are

a) $x-y+2=0$, $x-y-1=0$ b) $x-y-1=0$, $x-y=0$

c) $x+y-1=0$, $x-y-2=0$ d) $x-y=0$, $x+y=0$

Q.35 The value of f(x) = (x-2)$(x-3)^2$ is

a) 7/3 b) 3 c) 4/27 d) 0

Q.36 The Least value $f(x) = e^x + e^{-x}$

a) -2 b) 0 c) 2 d) can't be determine

Q.37 The maximum value of y= sin$x$.cos$x$is

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) $\sqrt{2}$ (d) $2\sqrt{2}$

Q.38. If the function $f(x) = x^3+ax^2+bx+1$ is maximum at x=0 and x=1 then :

(a) $a = \frac{2}{3}$, b = 0 (b) $a = -\frac{3}{2}$, b=0 (c) a = 0 , $b = \frac{3}{2}$ (d) None of These

Q.39 The smallest value of polynomial $3x^4 - 8x^3 + 12x^2 - 48x + 1$ in [1, 4]is:

a) -49 b) 59 c) -59 d) 257

Q.40 The function $f(x) = 2x^3 - 3x^2 - 12x + 4$, has:

a) Two points of local maximum b) Two points of local minimum

c) one maxima and one minima d) no maxima or minima

Q.41 The sum of two non-zero numbers is 8, the minimum value of the sum of their reciprocals is:

a) ¼ b) ½ c) 1/8 d) None of these

Q.42 The point on the curve $x^2 = 2y$ which is nearest to the point (0 , 5) is

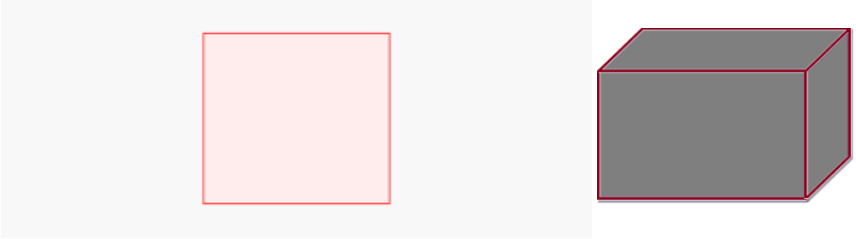
a) (2√2 , 4) b) (2√2 , 0) c) (0 , 0) d) (2 , 2)

Q.43 The maximum value of $[x(x-1) + 1]^{1/3}$, $0 \le x \le 1$ is

a) $\left(\frac{1}{3}\right)^{\frac{1}{3}}$ b) ½ c) 1 d) 0

CASE STUDY QUESTIONS

1. Yash wants to prepare a handmade gift box for his friend's birthday at his home. For making lower part of the box, he took a square piece of paper of each side equal to 10 cm.



Based on the above information answer the following questions.

(i) If x cm be the size of square piece cut from each corner of the paper of size 10 cm, then possible value of x will be given by interval

(a) (0,10) (b) (5,10) (c) (0,5), (d) (10,15)

(ii) Volume of the open box formed by folding up the cutting corner can be expressed as

(a) V=2x(10-2x)(10-2x) (b) V=x(10-2x)(10-2x)

(c) V=x(10-x)(10-2x) (d) V= x(10-x)(10-x)

(iii) The value of x for which $\frac{dV}{dx} = 0$ *is*

(a) 0,5 (b) 5/3 ,0 *(c) 5/3,5* (d) 3,4

(iv) Yash is interested to maximise the volume of the box, So what will be the side of the square to be cut to maximise the volume

(a) 5cm *(b) 5/3cm* (c) 3cm (d) 4cm

(v)The maximum volume is

(a) $\frac{1000}{27}\,cm^3$ *(b)* $\frac{3000}{27}\,cm^3$ *(c)* $\frac{2000}{27}\,cm^3$ (d) $\frac{1000}{3}\,\mathrm{cm}^3$

2. A tank with rectangular base of length x metre, breath y metre and rectangular side, open at the top is to be constructed so that the depth is 1 m and volume is $9m^3$.If building of tank is Rs 70 per square metre for the base and Rs 45 per square metre for the sides?

Based on above information answer the following questions.

(i) What is the cost of the base?

(a) 9xy *(b) 70xy* (c) xy (d) 50xy

(ii) What is the cost of making all the sides?

(a) *90(x+y)* (b) 90xy (d) 9(x+y) (d) 40(x +y)

(iii) If 'C' be the total cost of the tank , then $\frac{dC}{dx}$ is

(a)90(1-$\frac{9}{x^2}$) (b)70(1-$\frac{9}{x}$) (c)180(1-$\frac{8}{x^2}$) (d)140(1-$\frac{9}{x^2}$)

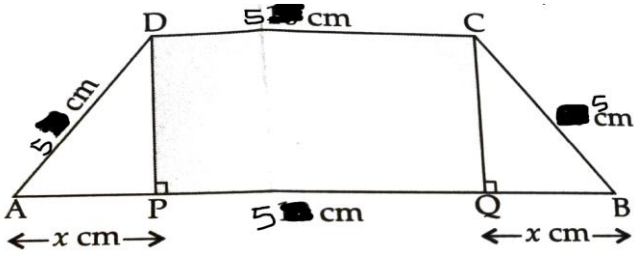
(iv) For what value of x,C is minimum?

(a) 2 (b) 1 *(c) 3* (d)5

(iv) What is the least cost of construction?

(a) Rs 1000 (b) Rs 1170 (c) Rs 1270 (d) 1570

3. There is a bridge whose length of three sides of a trapezium other than base are equal to 5cm



Based on the above information answer the following

(i) What is the value of DP

(a) $\sqrt{25-x^2}$ (b) $\sqrt{x^2-25}$ (c) $25-x^2$ (d) x^2-25

(ii) What is the area of the trapezium A(x) ?

(a) (x+5)$\sqrt{25-x^2}$ (b)(x-5)$\sqrt{25-x^2}$

(c)(x-5) $(25-x^2)$ (d)(x-10) (x^2-100)

(iii) A'(x) =0 then what is the value of x?

(a) 5, -10 (b) 2.5, -5 (c) -5,-2.5 (d) 5,10

(iv)What is the value of A"(2.5)

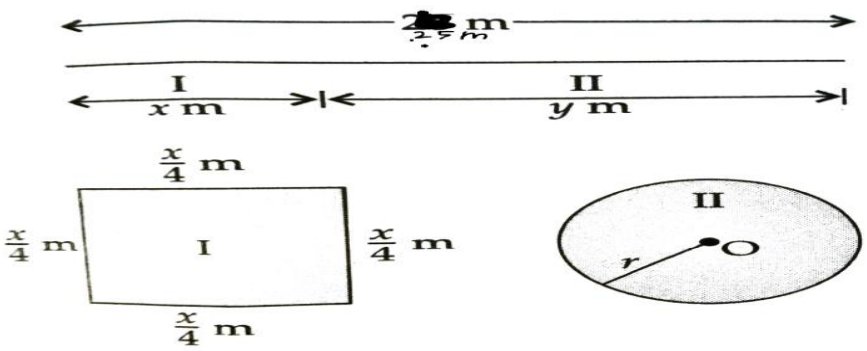
(a) $-\frac{15}{\sqrt{18.75}}$ (b)$-\frac{30}{\sqrt{18.75}}$ (c) $\frac{15}{\sqrt{18.75}}$ (d) $-\frac{30}{\sqrt{80}}$

(v)What is the value of maximum area ?

(a)$75\sqrt{18.75}cm^2$ (b)$10\sqrt{18.75}cm^2$

(c)$75\sqrt{5}\text{cm}^2$ (d)$75\sqrt{7}cm^2$

4. A piece of wire of length 25cm is to be cut into pieces one of which is to bent into the form of a square and other into the form of a circle.



Based on the above information, answer the following question:

(i) What is the total area of the square and circle?

(a) $(\frac{x}{4})^2+\pi r^2$ (b) $(\frac{x}{2})^2+\pi r^2$

(c) $(\frac{x}{4})^2+\pi r$ (d)$(\frac{x}{2})^2+\pi r$

(ii) What is the relation of r with y?

(a) r = $\frac{y}{\pi}$ (b) r = $\frac{y}{2\pi}$ (c) r = $\frac{xy}{\pi}$ (d) r = $\frac{xy}{2\pi}$

(iii) If we talk about total length of wires then what is the relation between x and y?

(a) X+y =25 (b) x+y=28 (c) x+y =26 (d) x+y =27

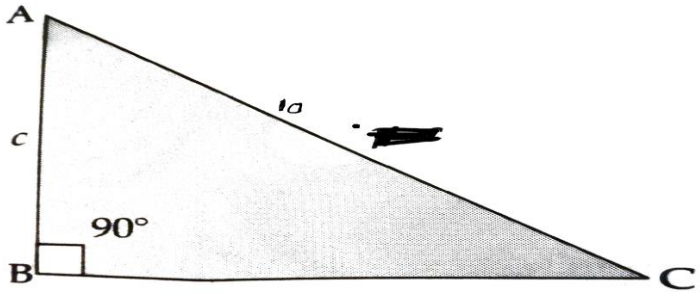
(iv) When $\frac{dA}{dy}=0$, then find the value of y

(a) $\frac{50\pi}{\pi+4}$ (ii)$\frac{75}{\pi+8}$ *(c)* $\frac{25\pi}{\pi+4}$ *(d)*$\frac{100}{\pi+8}$

(v) Again, when $\frac{dA}{dy}=0$, then the value of x.

(a) $\frac{50}{\pi+4}$ (b) $\frac{100}{\pi+4}$ (c) $\frac{25}{\pi+4}$ (d)$\frac{50\pi}{\pi+4}$

5.The sum of the length hypotenuse and a side of a right-angled triangle is given by AC+BC = 10



Based on the above information answer the following questions:

(i) Base BC =?

(a) $\frac{100-c^2}{20}$ (b)$\frac{100+c^2}{20}$ $(c)\frac{c^2-100}{20}$ $(d)\frac{10-c^2}{20}$

(ii) If 'S' be the area of the triangle, then find the value of $\frac{dS}{dc}$?

(a) $\frac{100-3c^2}{20}$ (b) $\frac{100-3c^2}{40}$ (c)$\frac{3c^2-100}{20}$) $(d)\frac{100+3c^2}{40}$

(iii) What are the values of c when $\frac{dS}{dc}=0$?

$(a)\frac{10\sqrt{3}}{3}$ (b)$\frac{20\sqrt{3}}{3}$ (c)$\frac{5\sqrt{3}}{3}$ (d)$\frac{15\sqrt{3}}{3}$

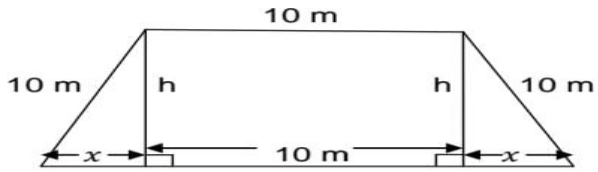
(iv) Find the values of $\frac{d^2S}{dc^2}$ at c =$\frac{10\sqrt{3}}{3}$

(a)-$\frac{3}{2}$ $(b)\frac{\sqrt{3}}{2}$ (c)$\frac{-\sqrt{3}}{2}$ (c) $\frac{1}{2}$

(v) Find BC ,when c= $5\sqrt{3}$

$(a)\frac{5}{4}$ (b)$\frac{5}{3}$ $(c)\frac{5}{6}$ $(d)\frac{7}{4}$

6. The front gate of a building is in the shape of a trapezium as shown below. Its three sides other than base are 10m each. The height of the gate is h meter. On the basis of this information and figure given below answer the following questions:



(i) . The area A of the gate expressed as a function of x is

a. (10+x)$\sqrt{100+x^2}$

b. (10-x)$\sqrt{100+x^2}$

c. (10+x)$\sqrt{100-x^2}$

d. (10-x)$\sqrt{100-x^2}$

(ii) . The value of $\frac{dA}{dx}$ is

a. $\frac{2x^2+10x-100}{\sqrt{100-x^2}}$

b. $\frac{2x^2-10x-100}{\sqrt{100-x^2}}$

c. $\frac{2x^2+10x+100}{\sqrt{100-x^2}}$

d. $\frac{-2x^2-10x+100}{\sqrt{100-x^2}}$

(iii). For which positive value of x , $\frac{dA}{dx}$ =0

a. 10

b. 5

c. 20

d. 15

(iv). If at the value of x where $\frac{dA}{dx}$ =0 area of trapezium is maximum then what is maximum area of trapezium ?

a. 25$\sqrt{3}$ sqm

b. 100$\sqrt{3}$ sqm

c. 75$\sqrt{3}$ sqm

d. 50$\sqrt{3}$ sqm

(v). If the area of trapezium is maximum then the value of $\frac{d^2A}{dx^2}$ is

a. positive

b. negative

c. 0

d. none of these

ASSERTION AND REASON

1. **Assertion (A) : The tangent to the curve $y = x^3 - x^2 - x + 2$ at (1,1) is parallel to the x - axis .**
   Reason (R): The slope of the tangent to the curve at (1,1) is zero.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

2. **. Assertion (A) Tangent to the curve $y = 2x^3 + x^2 + 2$ at the point (-1,0) is parallel to the line y = 4x+3**

Reason (R): Slope of the tangent at (-1,0) is 4 equal to the slope of the given line .

A. A is false but R is true

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. Both A and R are true and R is the correct explanation of A

3. **Assertion(A): Function f(x)=$= \mathbf{x^3 - 3x^2 + 3x + 2}$ is always increasing.**

Reason(R):Derivative f'(x) is always negative.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

4. **Assertion(A): Y = sinx is increasing in the interval $(\frac{\pi}{2}, \pi)$**

Reason(R): $\frac{dy}{dx}$ is negative in the given interval.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

5. **Assertion(A): $y = e^x$ is always strictly increasing function.**

Reason (R): $\frac{dy}{dx} = e^x > 0$ for all real values of x.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

6. **Assertion(A): $y = \log(1 + x) - \frac{2x}{2+x}$,x>-1 is a decreasing function of x throughout its domain**

Reason (R): $\frac{dy}{dx} > 0$ for all x>-1

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

7. **Assertion(A): Function f(x) =$x + \frac{1}{x}$ is strictly increasing in the interval (-1,1)**

Reason(R) : Derivative f'(x) <0 in the interval

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

8. Function f(x) = log cosx is strictly increasing on $(0, \frac{\pi}{2})$

Reason (R): Slope of tangent on the above curve is negative in the given interval.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

9. Assertion (A): Slope of the tangent to the curve y = $3x^4 - 4x$ at x=4 is 764

Reason (R): The value of $\frac{dy}{dx} = 12x^3 - 4$ is 764 at x= 4

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

10. Assertion(A): Tangents to the curve y = $7x^3 + 11$ at the points where x = 2 and x = – 2 are parallel.

Reason(R): Slope of tangents at both the points are equal.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

11. Assertion(A): At the (3,27) on the curve $y = x^3$, slope of the tangent is equal to y coordinate of the point.

Reason (R): $\frac{dy}{dx} = 3x^2 = 27 \; at \; x = 3$

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

12. Assertion(A): The line y = x + 1 is a tangent to the curve y^2= 4x at the point (1,2).

Reason (R) : Slope of tangent to the given curve at the given point is 1 and the point also satisfies equation of the line.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

13. Assertion (A): x = 0 is the point of local maxima of the function f given by $f = 3x^4 + 4x^3 - 12x^2 + 12$

Reason(R): $f'(x) = 0$ at $x = 0$ and also $f''(x) < 0$ at $x = 0$

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

14. Assertion (A): Maximum value of the function f(x) = $(2x - 1)^2 + 3$ is 3.

Reason(R): f(x)≥ 3 for all real values of x.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

15. Assertion f(x) = e^x do not have maxima and minima

Reason (R) : f '(x) = $e^x \neq 0$ for all real values of x.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is the correct explanation of A

C. A is true but R is false

D. A is false but R is true

LINEAR PROGRAMMING

MULTIPLE CHOICE QUESTIONS

1. A Linear function, which is minimized or maximized is called
   (a) an objective function (b) an optimal function
   (c) A feasible function (d) None of these
2. The maximum value of Z = 3x + 4y subject to the constraints :
   x+ y $\leq$ 4, x $\geq$ 0 , y $\geq$ 0 is :
   (a) 0 (b) 12 (c) 16 (d) 18
3. The maximum value of Z = 2x +3y subject to the constraints :
   $x + y \leq 1, 3x + y \leq 4, x, y \geq 0$is
   (a) 2 (b) 4 (c) 5 (d) 3
4. The point in the half plane $2x + 3y - 12 \geq 0$ is :
   (a) (- 7,8) (b) (7 , - 8) (c) (-7 , - 8) (d) (7, 8)
5. Any feasible solution which maximizes or minimizes the objective function is Called:
   (a) A regional feasible solution (b)An optimal feasible solution
   (c)An objective feasible solution (d) None of these
6. The solution set of the in equation $2x + y > 5$ is
   (a) Half plane that contains the origin

(b) Open half plane not containing the origin

(c) Whole xy −plane except the points lying on the line $2x + y = 5$

(d) None of these

7. Objective function of a LPP is

(a) a constraint (b) a function to be optimized

(c)a relation between the variables (d) none of these

8. The maximum value of $Z = 4x + 2y$ subjected to the Constraints$2x + 3y \leq 18$,$x + y \geq 10$;$x, y \geq 0$ is

(a) 320 (b) 300 (c) 230 (d) none of these

9.The optimal value of the objective function is attained at the points :

(a) Given the intersection of inequations with the axes only

(b) Given by intersection of inequations with X-axis only

(c) Given by corner points of the feasible region

(d) None of these.

10. If the constraints in a linear programming problem are changed :

(a) The problem is to be re-evaluated

(b) Solution is not defined

(c) The objective function has to be modified

(d) The change in constraints is ignored

11. Which of the following statements is correct?

(a) Every L P P admits an optimal solution

(b)A L P P admits unique optimal solution

(c) If a L P P admits two optimal solution solutions, it has aninfinite number of optimal solutions

(d) The set of all feasible solutions of a LPP is a finite set.

12.The feasible solution of a LPP belongs to

(a) First and second quadrants (b) First and third quadrants.

(c) Second quadrant (d) Only first quadrant.

13.The value of objective function is maximum under linear constraints

(a) At the centre of feasible region

(b) At (0,0)

(c) At any vertex of feasible region

(d)The vertex which is at maximum distance from (0,0)

14. Which of the term is not used in a linear programming problem :

(a) Slack inequation (b) Objective function

(c) Concave region (d) Feasible Region

15. A linear programming of linear functions deals with :

(a) Minimizing (b) Optimizing (c) Maximizing (d) None

16. By graphical method, the solution of linear programming problem

Maximize : Z= 3x + 5y

Subject to : 3x +2y $\leq$ 18 , x $\leq$ 4, y $\leq$ 6 and x, y $\geq$ 0 ,is

(a) x = 2 ,y = 0 ,Z = 6 (b) x = 2 , y = 6, z=36

(c) x=4, y = 3 , Z= 27 (d) X = 4, y = 6,Z = 42

17. Maximum value of the objective function $Z = 4x + 3y$ subject to the constraints $3x + 2y \leq 160, 5x + 2y \geq 200, x + 2y \geq 80$, $x, y \geq 0$ is

(a) 320 (b) 300 (c) 230 (d) none of these

18. The point at which the maximum value of $x + y$, subject to the Constraints $x + 2y \leq 70$, $2x + y \leq 95$, $x, y \geq 0$is obtained, is

(a) (30, 25) (b) (20, 35) (c) (35 ,20) (d) (40 , 15)

19.The corner points of the feasible region determined by the following System Of linear inequalities: $2x + y \leq 10$, $x + 3y \leq 15$, $x, y \geq 0$ are (0,0),(5,0), (3,4) and (0, 5) .
Let $Z = px + qy$, where p , $q > 0$.Condition on p and $q$so that the maximum of Z occurs at both (3, 4) and (0, 5) is

(a) $p = q$ (b) $p = 2q$ (c) $p = 3q$ (d) $q = 3p$

20. Solution set of inequations $x - 2y \geq 0, 2x - y \leq -2$, $x \geq 0$, $y \geq 0$ is

(a) First quadrant (b) infinite

(c)Empty (d) closed half plane

CASE STUDY QUESTIONS

I. A small firm manufacturers gold rings and chains. The total number of rings and chains manufactured per day is atmost 24 . it takes 1 hour to make ring and 30 minutes to make a chain . The maximum number of hours available per day is 16 . If the profit on a ring is Rs.300 and that on a chain is Rs.190 . Firm is concerned about earning maximum profit on the number of rings(x) and chains(y) that have to be manufactured per day .

Using the above information give the answer of the following questions.

(i) The objective function is

(a) $190x + 300y$ (b) $300x + 190y$ (c) $x + y$ (d) none of the above

(ii) For maximum profit firm has to make the number of rings and chains –

(a) 0,24 (b) 8,16 (c) 16,8 (d) 16,0

(ii) Corner points of feasible region are

(a) (0,24) (b) (8,16) (c) a &b both (d) (12,0)

(iv) Maximum profit earned by the firm is equal to

(a) 6440 (b) 4560 (c) 5000 (d) 5440

(v) Constraints of the above LPP are

(a) $x \leq 0$ (b) $2x + y \leq 32$ (c) $y \geq 1$ (d) none of the above

II. A company started airlines business and for running business it bought aeroplanes . Now an aeroplane can carry maximum of 200 passengers . A profit of Rs.400 is made on each first class ticket and a profit of Rs.300 is made on each second class ticket . The airline reserves at least 20 seats for first class .However , at least four times as many passengers prefer to travel by second class then by first class . Company wants to make maximum profit by selling tickets of first class (x) and second class (y) .

Using the above information give the answer of the following questions.

(i) To get maximum profit how many first class tickets should be sold –

(a) 20 (b) 180 (c) 160 (d) 40

(ii) Difference between the maximum profit and minimum profit is equal to

(a) 8000 (b) 56000 (c) 64000 (d) none of the above

(iii) Corner points of feasible region are

(a) (20,180) (b) (20,0) (c) (40,0) (d) all the above

(iv) Minimum profit is equal to

(a) 8000 (b) 6000 (c) 64000 (d) none of the above

(v) The objective function is

(a) $400x + 300y$ (b) $300x + 400y$ (c) $x + y$ (d) none of the above

ASSERTION AND REASON

Directions (Q. Nos. 1-5) Each of these questions contains two statements: Assertion (A) and Reason (R). Each of these questions also has four alternative choices, any one of which is the correct answer. You have to select one of the codes (a), (b). (c) and (d) given below.

(a) A is true, R is true: R is a correct explanation for A.

(b) A is true, R is true; R is not a correct explanation for A.
(c) A is true: R is false.
(d) A is false: R is true.

1. **Assertion (A)** Maximum value of $Z = 11x + 7y$, subject to constraints $2x + y \leq 6, x \leq 2 , x \geq 0 , y \geq 0$ will be obtained at (0,6) .

Reason (R) In a bounded feasible region, it always exist a maximum and minimum value.

2. **Assertion (A)**The linear programming problem, maximize $Z = 2x + 3y$
subject to constraints $x + y \leq 4 , x \geq 0 , y \geq 0$
It gives the maximum value of Z as 8 .

Reason (R) To obtain maximum value of Z, we need to compare value of Z at all the corner points of the feasible region .

3. **Assertion (A)** For an objective function $Z = 4x + 3y$, corner points are (0,0), (25,0) , (16,16) and (0,24) . Then optimal values are 112 and 0 respectively .

Reason (R) Themaximum or minimum values of an objective function is known as optimal value of LPP . These values are obtained at corner points .

4. Assertion (A) Objective function $Z = 13x - 15y$, is minimized subject to constraints $x + y \leq 7 , 2x - 3y + 6 \geq 0 , \ x \geq 0 , y \geq 0$ occur at corner point (0,2) .

Reason (R) If the feasible region of the given LPP is bounded , then the maximum or minimum values of an objective function occur at corner points .

5. Assertion (A) Maximise$Z = 3x + 4y$, subject to constraints : $x + y \leq 1 ,, \ x \geq 0 , y \geq 0$.
Then maximum value of Z is 4 .

Reason (R) If the shaded region is not bounded then maximum value cannot be determined.

ANSWERS

RELATIONS AND FUNCTIONS

ANSWERS OF MCQ

1- Answer: (a) Reflexive
2- Answer: (a) f is one-one onto
3- Answer: (c) {0,3,4,5,-3,-4,-5}
4- Answer: (d) (8,10) € R
5- Answer: (c) 24
6- Answer: (c) R is symmetric
7- Answer: (a) f is one-one and onto
8- Answer: (a) Ax B
9- Answer: (c) equivalence
10- Answer: (d) 5
11- Answer: (b) reflexive, transitive but not symmetric
12- Answer: (a) reflexive but not symmetric
13- Answer: (b) f(x) = x + 2
14- Answer: (d) Reflexive, transitive but not symmetric
15- Answer: (d) Equivalence relation
16- Answer: (c) many-one onto
17- Answer: (a) f is bijective
18- Answer: (c) one-one but not onto
19- Answer: (c) a bijection
20- Answer: (a) one-one but not onto
21- Answer: (b) one-one into
22- Answer: (a) a bijection

23- Answer: (c) bijective

24- **Answer/Explanation**
Answer: (d) Explanation: (d), not reflexive, as l_1 R l_2
$\Rightarrow l_1 \perp l_1$ Not true
Symmetric, true as l_1 R $l_2 \Rightarrow$ l2R h
Transitive, false as l_1 R l_2, l_2 R l_3
$\Rightarrow l_1 \parallel l_3$. l_1 R l_2.

25- **Answer/Explanation**
Answer: c
Explanation: (c), here (1,2) e R, (2,1) € R, if transitive (1,1) should belong to R.

26- **Answer/Explanation**
Answer: b
Explanation: (b), A relation R is an identity relation in set A if for all a ∈ A, (a, a) ∈ R.

27- **Answer/Explanation**
Answer: c
Explanation: (c), total injective mappings/functions= $^4P_3 = 4! = 24$.

ANSWER OF CASE STUDY BASED QUESTIONS

CASE STUDY- 1

1- Sol. (a) reflexive
Explanation. Clearly, (1, 1), (2, 2), (3, 3), ∈ R. So, R is reflexive on A. Since, (1, 2) ∈ R but (2, 1) ∉ R. So, R is not symmetric on A. Since, (2, 3), ∈ R and (3, 1) ∈ R but (2, 1) ∉ R. So, R is not transitive on A.

2- Sol. (b) Symmetric
Explanation. Since, (1, 1), (2, 2) and (3, 3) are not in R. So, R is not reflexive on A. Now, (1, 2) ∈ R ⇒ (2, 1) ∈ R and (1, 3) ∈ R ⇒ (3, 1) ∈ R. So, R is symmetric Clearly, (1, 2) ∈ R and (2, 1) ∈ R but (1, 1) ∉ R. So, R is not transitive.

3- Sol. (c) transitive
Explanation. We have, R = {(x, y) : y = x + 5 and x < 4}, where x, y ∈ N.
∴ R = {(1, 6), (2, 7), (3, 8)} Clearly, (1, 1), (2, 2) etc. are not in R.
So, R is not reflexive. Since, (1, 6) ∈ R but (6, 1) ∉ R.
So, R is not symmetric. Since, (1, 6) ∈ R and there is not order pair in R which has 6 as the first element.
Same is the case for (2, 7) and (3, 8). So, R is transitive.

CASE STUDY- 2

1. (d) (X,Y) ∉R

2. (a) both (X,W) and (W,X) ∈ R

3. (a) (F1,F2) ∈R, (F2,F3) ∈ R and (F1,F3) ∈ R

4. (c) Equivalence relation

5. (a) All those eligible voters who cast their votes

CASE STUDY- 3

1. (a) Reflexive and transitive but not symmetric

2. (a) 6^2

3. (d) None of these three

4. (d)2^{12}

5. (b) Reflexive and Transitive

CASE STUDY- 4
1- Sol. (a) R – {2} Explanation. For f(x) to be defined x – 2 ≠ 0 i.e. x ≠ 2 ∴ Domain of f = R – {2}
2- Sol. (b) R – {1} Explanation. Let y = f(x), then y **=** $x - 1/x - 2$ **∴xy – 2y = x – 1 ⇒xy– x = 2y – 1 ⇒ x = 2**$y - 1/y - 1$ Since, x ∈ R – {2}, therefore y ≠ 1 Hence, range of f = R – {1}
3- Sol. (d) $x/x - 2$
4- Sol. (a) One-one Explanation. We have, g(x) = $x/x - 2$ Let $g(x_1) = g(x_2) \Rightarrow x1/x1 - 2 = x2/x2 - 2 \Rightarrow x_1x_2 - 2x_1 = x_1x_2 - 2x_2 \Rightarrow 2x_1 = 2x_2 \Rightarrow x_1 = x_2$ Thus, $g(x_1) = g(x_2) \Rightarrow x_1 = x_2$ Hence, g(x) is one-one.
5- Sol. (c) $f(x_1) = f(x_2) \Rightarrow x_1 = x_2$

ANSWERS OF ASSERTION AND REASON

1. a 2. a 3. a 4. c 5. c 6. a 7. b 8. c 9. c 10. d11. a 12. a 13. c 14. a 15. a 16. b 17. b 18. c 19. c 20. c

INVERSE TRIGONOMETRIC FUNCTION

ANSWERS OF MCQ

1- Answer- (a) 1
2- Answer- (d) $\pi/3$
3- Answer- (b) 3 $\cos^{-1}x$
4- Answer- (b) $-\pi/3$
5- Answer- (d) None of these
6- Answer- (b) $\pi/2$
7- Answer- (b) $\pi/3$
8- Answer- (b) $\pi/6$
9- Answer- (d) $-\pi/4$
10- Answer- (a) $\pi/4$
11- Answer- (b) $-\pi/2 \leq y \leq \pi/2$
12- Answer- (b) $5\pi/6$
13- Answer- (d) 1
14- Answer- (d) $-\pi/6$
15- Answer- (a) [0, 1]
16- Answer- (c) [0, π]
17- Answer- (d) $[-\pi/2, \pi/2] - [0]$
18- Answer- (b) 1

19- Answer- (a) $3\pi/5$
20- Answer - (a) [0, 1]
21- Answer- (a) [1, 2]
22- Answer- (b) $2/5$
23- Answer (c) 0.96
24- Answer- (a) $\pi/2$
25- Answer- (b) $5\pi/6$
26- Answer- (d) $2a/1-a^2$
27- Answer- (c) $24/25$
28- Answer- (d) $-\pi/6$
29- Answer- (c) $5\pi/6$
30- Answer- (b) $\pi/3$
31- Answer- (a) $-\pi/3$
32- Answer- (b) $\pi/4$
33- Answer- (a) $5\pi/6$
34- Answer- (a) $\pi/6$
35- Answer- (b) $\pi/3$
36- Answer- (b) $\pi/3$
37- Answer- (a) $5\pi/6$
38- Answer- (d) 0
39- Answer- (a) $\pi/3$

ANSWER OF CASE STUDY BASED QUESTIONS

Case Study 1

1.a 2.c 3.a 4.a 5.c

Case Study 2

1 a) 1139.4 km 2 c) 1937 km 3 b) 577.52 km 4 b) $\cot^{-1} 1$ 5 c) 1937 km

Case Study 3

1.a 2.d 3.a 4.c 5.b

ANSWERS OF ASSERTION AND REASON

1. d 2. a 3. d 4. c 5. a 6. c 7. a 8. b 9. a 10. C

MATRICES

ANSWERS OF MCQ

1. (d) 2,

Explanation: $[x \quad 1]\begin{bmatrix}1 & 0\\ -2 & 0\end{bmatrix} = [0 \quad 0]$

$[x-2 \quad 0] = [0 \quad 0]$

x-2=0

x=2

2. (a) $[28]$

3. (b) Not possible to find

4. (d) 512,

Explanation: Total elements are 6 and each entry can be done in 2 ways.

Hence, total possibilities = $2^9 = 512$

5. (b) $\frac{\pi}{3}$

Explanation: $A + A' = I$

$\begin{bmatrix}\cos\alpha & -\sin\alpha\\ \sin\alpha & \cos\alpha\end{bmatrix} + \begin{bmatrix}\cos\alpha & \sin\alpha\\ -\sin\alpha & \cos\alpha\end{bmatrix} = \begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

$\begin{bmatrix}2\cos\alpha & 0\\ 0 & 2\cos\alpha\end{bmatrix} = \begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

$2\cos\alpha = 1$

$\cos\alpha = \frac{1}{2}$

$\alpha = \frac{\pi}{3}$

6. (d) AB=BA=I

7. (a) square matrix

8. (a) Skew-symmetric matrix,

Explanation: $(AB - BA)' = (AB)' - (BA)'$

$= B'A' - A'B'$

$= BA - AB$

$= -(AB - BA)$

9. (b) Skew-symmetric matrix

10. (b) 4,

Explanation: 6 → 1 × 6, 2 × 3, 3 × 2, 6 × 1.

11.(d)$\frac{16}{5}$

12. (d) 64,

Explanation: Total elements are 6 and each entry can be done in 2 ways.

Hence, total possibilities = $2^6 = 64$.

13. (a) I

Explanation: $(I + A)^2 - 3A = I^2 + IA + AI + A^2 - 3A = I + A + A + A - 3A = I$

14. (d)$\begin{bmatrix}4 & 0\\ 0 & 4\end{bmatrix}$

15. (a) all zeroes

Explanation: Iin skew symmetric matrix, $a_{ij} = -a_{ji}$

$\Rightarrow a_{ii} = -a_{ii} \Rightarrow 2a_{ii} = 0$

$\Rightarrow a_{ii} = 0$, i.e. diagonal elements are zeroes.

16. (b) x = y

Explanation: $\begin{bmatrix}5 & x\\ y & 0\end{bmatrix} = \begin{bmatrix}5 & y\\ x & 0\end{bmatrix} \Rightarrow x = y$

17. (c) a zero matrix of order n × n

Explanation: $a_{ij} = a_{ji}$, $a_{ij} = -a_{ji}$ and $a_{ii} = 0$

18. (c) F(x + y)

Explanation: $\begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}\begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix} = \begin{bmatrix} \cos(x+y) & \sin(x+y) \\ -\sin(x+y) & \cos(x+y) \end{bmatrix}$

19. (c) $\begin{bmatrix} \frac{1}{2} & -1 \\ \frac{1}{2} & 0 \end{bmatrix}$

20. (c) I

Explanation: $A^2 = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = I$

$A^6 = (a^2)^3$=I

21.(c) diagonal matrix

Explanation: $A^2 - 5a - 7I = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} - 5\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} - 7\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$=\begin{bmatrix} -14 & 0 \\ 0 & -14 \end{bmatrix}$

22. (c) 6

Explanation: 18 → 1 × 18, 2 × 9, 3 × 6, 6 × 3, 9 x 2, 18 x 1.

23. (d) n × m

24. (d) none of these

25. (d) 1

Explanation: $\begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}\begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix} = k\begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix} - 2\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\begin{bmatrix} 1 & -2 \\ 4 & -4 \end{bmatrix}=\begin{bmatrix} 3k-2 & -2 \\ 4 & -2k-2 \end{bmatrix}$

$3k - 2 = 1$

Hence, $k = 1$

ANSWER OF CASE STUDY BASED QUESTIONS

1. (a) (iii) ₹ 46,000

(b) (ii) ₹ 53,000

(c) (iv) ₹ 31,000

(d) (i) (₹ 15,000, ₹ 17,000)

(e) (iii) ₹ 32,000

2. (a)(iii) $\begin{bmatrix} 7 & 2 \\ 1 & 6 \end{bmatrix}$

(b) (i) $\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$

(c) (ii) $\begin{bmatrix} -2 & 2 \\ -4 & -6 \end{bmatrix}$

(d) (iii) $\begin{bmatrix} -4 & -4 \\ -6 & 4 \end{bmatrix}$

(e) (iii) $\begin{bmatrix} 8 & 0 \\ 2 & 10 \end{bmatrix}$

3. (a) (i) A + B

(b) (i) 10000

(c) (ii) A – B

(d) (i) ₹ 100, ₹ 200 and ₹ 120

(e) (ii) ₹ 1000, ₹ 600, ₹ 200

4. (a) (ii) $\begin{bmatrix} 40 & 30 & 50 \\ 20 & 80 & 10 \\ 40 & 60 & 5 \end{bmatrix}$

(b) (iv) Number of USB type 'C' = 5 Produced by company = I
(c) (ii) 360
(d) (i) 670
(e) (i) 10

ANSWERS OF ASSERTION AND REASON

1. i) A **ii)** C **iii)** A **iv)** D **v)** B **vi) C** **vii)** A **viii)** A

DETERMINANTS

ANSWERS OF MCQ

1. (c) 100
Explanation: $A(\text{adj}A) = |A|I$
$|A|I = 10I$
$|A| = 10$
Now, $|\text{adj } A| = |A|^{n-1}$
So, $|\text{adj } A| = |A|^{3-1}$
$|\text{adj } A| = 10^2 = 100$
2. (d) $\Delta - \Delta_1 = 0$
Explanation: $\Delta_1 = \begin{vmatrix} Ax & By & Cz \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix}$
$C_1 \to xC_1, C_2 \to yC_2$ and $C_3 \to zC_3$ and divide by xyz

$$\Delta_1 = \frac{1}{xyz}\begin{vmatrix} Ax^2 & By^2 & Cz^2 \\ x^3 & y^3 & z^3 \\ xyz & zxy & xyz \end{vmatrix} = \frac{xyz}{xyz}\begin{vmatrix} Ax^2 & By^2 & Cz^2 \\ x^3 & y^3 & z^3 \\ 1 & 1 & 1 \end{vmatrix}$$

$$\Delta_1 = \begin{vmatrix} Ax^2 & x^3 & 1 \\ By^2 & y^3 & 1 \\ Cz^2 & z^3 & 1 \end{vmatrix}$$

$\Delta_1 = \Delta$

3. (b) $K^2|A|$
4. (d) $a_{11}A_{11} + a_{21}A_{21} + a_{31}A_{31}$
Explanation: as value of determinant is sum of the product of elements of any row and column and their respective cofactor
5. (d) $(A + B)^{-1} = A^{-1} + B^{-1}$
6. (a) $|A|^3$
Explanation: as $|A \cdot \text{adj } A| = |A|^n$, where A is matrix of order n × n.
7. (c) $k^3 |A|$
8. (b) –1
Explanation: we have $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix}$ = (1 + abc)(a – b)(b – c)(c – a) = 0.
Also $a \neq b \neq c \Rightarrow 1 + abc = 0$
$\Rightarrow abc = -1$.
9. (c) 0
10. (b) 0
11. (c) -1

Explanation: As, $\begin{vmatrix} 2 & 3 & 2 \\ x & x & x \\ 4 & 9 & 1 \end{vmatrix} + 3 = 0$

On expanding along first row,

$2(x - 9x) - 3(x - 4x) + 2(9x - 4x) + 3 = 0$

$x = -1$

12. (d) -7000

Explanation: As, $AB = \begin{bmatrix} 200 & 50 \\ 10 & 2 \end{bmatrix}\begin{bmatrix} 50 & 40 \\ 2 & 3 \end{bmatrix}$

$AB = \begin{bmatrix} 10000 + 100 & 8000 + 150 \\ 500 + 4 & 400 + 6 \end{bmatrix}$

$AB = \begin{bmatrix} 10100 & 8150 \\ 504 & 406 \end{bmatrix} = 4100600 - 4107600 = -7000$

13. (c) a^6

Explanation: as, $\det(A) = a^3$

$\det(\text{adj } A) = (a^3)^{3-1} = a^6$

14. (c) 9

Explanation: as, $|\text{adj } A| = |A|^{3-1}$

15. (c) ± 6

Explanation: as $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$

$2x^2 - 40 = 18 + 14$

$x = \pm 6$

16. (b) 3

Explanation: as, $\Delta = \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$

$9 = \frac{1}{2}\begin{vmatrix} -3 & 0 & 1 \\ 3 & 0 & 1 \\ 0 & k & 1 \end{vmatrix}$

$k = 3$

17. (d) $(A + B)^{-1} = B^{-1} + A^{-1}$

18. (d) $\begin{bmatrix} 1 & -2 \\ -3 & 4 \end{bmatrix}$

19. (b) $\frac{1}{17}\begin{bmatrix} 4 & 3 \\ -3 & 2 \end{bmatrix}$

20.(b) Symmetric matrix

21. (a) Every skew-symmetric matrix of odd order is non-singular

22. (a) $-(3A^2 + 2A + 5I)$

23.(a) m × n

24.(d) 8

25. (d) 3 x 3

ANSWER OF CASE STUDY BASED QUESTIONS

1. (a) (ii) x – y = 50, 2x + y = 550

(b) (i) $\begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 50 \\ 550 \end{bmatrix}$

(c) (iii) 200 m

(d) (i) 150 m

(e) (ii) 30000 Sq m

2. (a) (i) ₹ 2

(b) (iv) ₹ 17

(c) (i) ₹ 7

(d) (iv) ₹ 20

(e) (iii) ₹ 22

3. (i) (d) 12

Explanation: as, $x + y + z = 12$

$2x + 3y + 3z = 33$

$x - 2y + z = 0$

$A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 3 & 3 \\ 1 & -2 & 1 \end{bmatrix}, X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}, B = X = \begin{bmatrix} 12 \\ 33 \\ 0 \end{bmatrix}$

$|A| = 3$

$A^{-1} = \frac{1}{|A|} \text{adj } A = \frac{1}{3}\begin{bmatrix} 9 & -3 & 0 \\ 1 & 0 & -1 \\ -7 & 3 & 1 \end{bmatrix}$

$X = A^{-1}B = \frac{1}{3}\begin{bmatrix} 9 & -3 & 0 \\ 1 & 0 & -1 \\ -7 & 3 & 1 \end{bmatrix}\begin{bmatrix} 12 \\ 33 \\ 0 \end{bmatrix} = \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}$

$x = 3, y = 4, z = 5$

$x + y + z = 12$

(ii) (b) -z

(iii) (c) 5

(iv) (c) 11

(v) (b) 43

4. (i) (b) 900

Explanation: as, $3x + 2y + z = 1600$

$4x + y + 3z = 2300$

$x + y + z = 900$

$A = \begin{bmatrix} 3 & 2 & 1 \\ 4 & 1 & 3 \\ 1 & 1 & 1 \end{bmatrix}, X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}, B = X = \begin{bmatrix} 1600 \\ 2300 \\ 900 \end{bmatrix}$

$|A| = -5$

$A^{-1} = \frac{1}{|A|} \text{adj } A = \frac{1}{-5}\begin{bmatrix} -2 & -1 & 5 \\ -1 & 2 & -5 \\ 3 & -1 & -5 \end{bmatrix}$

$X = A^{-1}B = \frac{1}{-5}\begin{bmatrix} -2 & -1 & 5 \\ -1 & 2 & -5 \\ 3 & -1 & -5 \end{bmatrix}\begin{bmatrix} 1600 \\ 2300 \\ 900 \end{bmatrix} = \begin{bmatrix} 200 \\ 300 \\ 400 \end{bmatrix}$

$x = 200, y = 300, z = 400$

$x + y + z = 900$

(ii) (b) 2300

(iii) (c) 300

(iv) (d) 1300

(v) (a) 100

ANSWERS OF ASSERTION AND REASON

1. i) B **ii)** B **iii)** A **iv)** A **v)** A **vi) D** **vii)** C **viii)** C

CONTINUITY AND DIFFERENTIABILITY

ANSWERS OF MCQ

Q1 D Q2 C Q3 A Q4 A Q5 A Q6.A Q7.D Q8.B Q9 A Q10.D Q11.C Q12. D Q13. B Q14. C Q15.B Q16. A Q17.C Q18 A Q19 B Q20.C Q21.D Q22.A Q23.B Q24.A Q25.A Q26.C Q27.C Q28.A Q29.C Q30 D

ANSWER OF CASE STUDY BASED QUESTIONS

CASE STUDY-1

1. b 2. B 3. C 4. D 5. B

CASE STUDY-2

1. c 2. C 3. C 4. D 5. B

CASE STUDY-3

1. c 2. D 3. A 4. B 5. C

CASE STUDY-4

1. c 2. D 3. A 4. B 5. d

ANSWERS OF ASSERTION AND REASON

1. d 2. A 3. C 4. A 5. D 6. A 7. d 8. A 9. D 10. D 11. E 12. A

APPLICATION OF DERIVATIVES

ANSWERS OF MCQ

1. a 2. b 3. a 4. a 5. a 6. b 7. d 8. a 9. **a 10. a 11. b 12. d 13. a 14. a 15. a 16. a 17. c 18. a 19. b 20. A 21. d 22. b 23. b 24. b 25. d 26. c 27. c 28. c 29. a 30. b 31. d 32. a 33. d 34. b 35. c 36. c 37. b 38. b**39. **c 40. c 41. b 42. a 43. c**

ANSWER OF CASE STUDY BASED QUESTIONS

1.(i)a, (ii)b, (iii)c, (iv)b, (v)c2. (i) b, (ii)a, (iii)a, (iv)c, (v)b

3.(i)a, (ii) a, (iii)b, (iv)a, (v)b4.(i)a, (ii)b, (iii)a, (iv)c, (v)b

5.(i)a, (ii) (b), (iii) a, (iv) c, (v)a 6. (i)c, (ii)d, (iii)b, (iv)c, (v)b

ANSWERS OF ASSERTION AND REASON

1. A, 2.B, 3.C, 4.C, 5.A, 6.A, 7.C, 8.D, 9.A, 10.A, 11.A, 12.A, 13. A, 14.D, 15.A

LINEAR PROGRAMMING

ANSWERS OF MCQ

1 – a, 2 – c , 3 – c , 4 – d , 5 - b, 6 – b , 7- b , 8 – d , 9 –c , 10 – a, 11 – c , 12- d 13- c, 14 – c, 15 – b, 16 – b , 17 – a, 18- d, 19 – d (Max $z = 3p + 4q$ *and* $\max\ z = 5q$ *which gives*, $q = 3p$), 20 – c. (There will be no common region)

ANSWER OF CASE STUDY BASED QUESTIONS

1.(i) b (ii) b (iii) c (iv) d (v) b

II. (i) d (ii) a (iii) d (iv) a (v) a

ANSWERS OF ASSERTION AND REASON

1. b 2. d 3. a 4. a 5. c

केंद्रीय विद्यालय संगठन रायपुर संभाग

KENDRIYA VIDYALAYA SANGATHAN

RAIPUR REGION

Website -https://roraipur.kvs.gov.in

Email-ackvsroraipur@gmail.com