Sample Question Paper – 2 (TERM - I)

Class XII (Session - 2021-22)

Subject- Mathematics (Standard)

Time Allowed: 90 minutes **Maximum Marks: 40**

General Instructions:

1. This question paper contains three sections - A, B and C. Each part is compulsory.
2. Section - A has 20 MCQs, attempt any 16 out of 20.
3. Section - B has 20 MCQs, attempt any 16 out of 20.
4. Section - C has 10 MCQs, attempt any 8 out of 10.
5. All questions carry equal marks.
6. There is no negative marking.

SECTION–A

In this section, attempt any 16 questions out of the Questions $21 - 40$.

Each Question is of 1 mark weightage.

Q1: What is the domain of $\cos^{-1} x$?

(A) $[-\infty, \infty]$

(B) $(-\infty, \infty)$

(C) $(-1,1)$

(D) $[-1,1]$

Q2: Find $\frac{dy}{dx}$ where $x = a\cos^2\theta$ and $y = b\sin^2\theta$.

(A) $-\frac{b}{a}$

(B) $-\frac{b}{a}\sec\theta$

(C) $-\frac{b}{a}\tan\theta$

(D) $-\frac{b}{a}\cot\theta$

Q3: The tangent to curve $y = 3x^2 - x^3$ at $x = 2$ makes an angle θ with positive x-axis. Find the value of θ.

(A) $45°$

(B) $0°$

(C) $30°$

(D) $60°$

Q4: For the given matrix, the values of y is

$$\begin{bmatrix} x & 3x-y \\ 2x+z & 3y-w \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 4 & 7 \end{bmatrix}$$

(A) $x = 3$

(B) $x = 14$

(C) $y = 7$

(D) $y = -2$

Q5: If $y = x^6 + \log x^2$ then the value of $\frac{dy}{dx}$ is

(A) $6x^5 - 2x$

(B) $6x^5 + \frac{2}{x}$

(C) $6x^5 - \frac{2}{x}$

(D) $6x^6 + x^2$

Q6: If $A = \begin{bmatrix} 3 & 5 \\ 6 & -1 \end{bmatrix}$ then | A adj A | will be

(A) 95

(B) 0

(C) 950

(D) 957

Q7: Two numbers x and y related to each other as $x - y = 3$.

What is the value of the numbers such that their product is minimum?

(A) $x = 2.5, y = -0.5$

(B) $x = 1.5, y = -1.5$

(C) $x = 5.5, y = 2.5$

(D) $x = 1, y = -2$

Q8: The points on the curve $\frac{x^2}{9} + \frac{y^2}{16} = 1$ at which the tangent are parallel to y-axis.

(A) $(\pm 3, 0)$

(B) $(0, \pm 3)$

(C) $(\pm 2, 0)$

(D) $(0, \pm 2)$

Q9: Objective functions

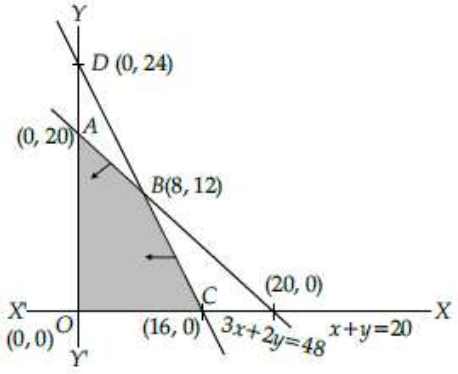
Maximize: $Z = 22x + 18y$

Constraints: $x + y \leq 20$

$360x + 240y \leq 5{,}760$

or $3x + 2y \leq 48$

$x \geq 0,\ y \geq 0$



The maximum Z =

(A) 360

(B) 392

(C) 352

(D) 342

Q10: Which of the following is true for the function $f(x) = \ln x + 2$ increasing.

(A) Function is strictly increasing in $(1,2)$.

(B) Function is strictly decreasing in $(1,2)$.

(C) Function is constant in $(1,2)$.

(D) None of the above

Q11: What is the equation of the normal to the curve $y = 3x^2 - 7x + 5$ at $(0,5)$?

(A) $x - 7y + 35 = 0$

(B) $7x - 3y + 35 = 0$

(C) $3x + 7y + 35 = 0$

(D) $3x + 7y + 21 = 0$

Q12: R be the relation in the set N given by $R = \{(a, b): a = b - 2, b > 6\}$.

Then, the correct option is:

(A) $(2,4) \in R$

(B) $(3,8) \in R$

(C) $(6,8) \in R$

(D) $(8,7) \in R$

Q13: All the trigonometric functions have inverse functions irrespective of the domain.

(A) True

(B) False

(C) True but for only sine, cos and tan

(D) None of the above

Q14: If matrix $A = [2 \quad 3 \quad 5]$, then the value of A.A' is:

(A) 38

(B) 26

(C) 39

(D) 28

Q15: The function $y = 5x^2 - 32x$ has a local minimum in the interval (0,10).

(A) $x = 1$

(B) $x = 2$

(C) $x = 3.2$

(D) No local minimum

Q16: Calculate the value of the given equation $2C_{11} + C_{12} - 3C_{13}$ where C_{ij} is the cofactor of the a_{ij} element of the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & -3 \\ -1 & 2 & 3 \end{bmatrix}$

(A) Determinant of the given matrix

(B) 0

(C) 10

(D) None of the above

Q17: What is the principal value of $\sin^{-1}\left(\frac{1}{2}\right)$?

(A) $\frac{\pi}{8}$

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

(C) $\frac{\pi}{12}$

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

Q18: If $A = \begin{bmatrix} 2 & 2 & 2 \\ 2 & 2 & 2 \\ 2 & 2 & 2 \end{bmatrix}$ then the value of $A^3 - 35$ A will be

(A) A

(B) 2 A

(C) 3 A

(D) 4 A

Q19: Let R be the relation in the set {p, q, r} given by R = {(p, p), (q, q), (r, r), (p, q)}. Then

(A) R is reflexive and symmetric but not transitive

(B) R is reflexive and transitive but not symmetric

(C) R is symmetric and transitive but not reflexive

(D) R is an equivalence relation

Q20: If A is a square matrix such that $A^2 = A$, then $(I + A)^2 - 3A$ is:

(A) 2I

(B) 3I

(C) I

(D) 4I

SECTION-B

In this section, attempt any 16 questions out of the Questions $21 - 40$.

Each Question is of 1 mark weightage

Q21: Let $A = \{a, b, c\}$ and $B = \{1,2,3\}$ and f: $A \to B$ is defined by

$f = \{(a, 2), (b, 1), (c, 3)\}$. The function is:

(A) both one-one and onto

(B) only one-one

(C) only onto

(D) neither of them

Q22: Find the $\frac{dy}{dx}$ of $y^x + x^y = 0$?

(A) $\frac{x^x \log y - x^y y}{xy^{y-1} + x^y \log y}$

(B) $\frac{-[y^x \log y + x^{y-1} \cdot y]}{xy^{x-1} + x^y \log x}$

(C) 0

(D) None of these

Q23: Corner points of the feasible region for an LPP are (0,2), (3,0), (6,0), (6,8) and (0,5). Let $F = 6x + 4y$ be the objective function.

The minimum value of F occurs at

(A) (0,2) only

(B) (3,0) only

(C) the mid-point of the line segment joining the points (0,2) and (3,0) only

(D) any point on the line segment joining the points (0,2) and (3,0).

Q24: Consider the curve $y = \frac{2x^2}{3}$.

The Slope of the line parallel to tangent to the curve at $x = -1$ is

(A) $\frac{1}{3}$

(B) $\frac{-1}{3}$

(C) $\frac{-4}{3}$

(D) $\frac{2}{3}$

Q25: Which of the following functions from Z into Z are bijections?

(A) $f(x) = x^5$

(B) $f(x) = x + 7$

(C) $f(x) = 6x + 5$

(D) $f(x) = x^2 + 9$

Q26: If $y = \log\left(\frac{1-x^3}{1+x^3}\right)$, then $\frac{dy}{dx}$ is equal to

(A) $\frac{6x^2}{1-x^6}$

(B) $\frac{-6x^2}{1-x^6}$

(C) $\frac{1}{4-x^6}$

(D) $\frac{-4x^2}{1-x^6}$

Q27: A set of values of the variables $x_1, x_2, x_3, \ldots \ldots \ldots \ldots, x_n$ satisfying the constraints of a L.P.P. is called a:

(A) Feasible solution of L.P.P.

(B) Solution of L.P.P.

(C) Both A and B

(D) None

Q28: If $y = 3\sin x + 2\cos x$, then $y + \frac{d^2y}{dx^2}$ is :

(A) $2\sin x + 3\cos x$

(B) 1

(C) 0

(D) $3\sin x + 2\cos x$

Q29: What is $\frac{d^2y}{dx^2} - \frac{dy}{dx}$ of the given function where $y = e^x \log \sin x$

(A) e^x

(B) $e^x(\text{cosec}^2 x + \cot x)$

(C) $\text{cosec}^2 x - \cot x$

(D) $e^x(-\text{cosec}^2 x + \cot x)$

Q30: Maximize $Z = 60x + 30y$

Subjected to $2x + 2y < 18; 3x + 4y < 34; x, y > 0$

(A) (0,17/2)

(B) (2,7)

(C) (9,0)

(D) None of these

Q31: If $y = \frac{k\cos\theta - \sin\theta}{\sqrt{\cos^2\theta - \cos 2\theta}}$ and $\left(\frac{dy}{d\theta}\right)_{x=30^\circ} = 1$ then k will be

(A) $-1/4$

(B) $-1/2$

(C) $1/2$

(D) 0

Q32: Find the local maxima and local minima of $f(x) = \frac{1}{x^2-2}$.

(A) $x = 1$

(B) $x = 0$

(C) $x = -1$

(D) $x = 7$

Q33: Let f: R → R be defined as $f(x) = x^4$. 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

Q34: What is the domain of $f(x) = \frac{x^3-x^2+4x+7}{(x+11)(x^2-1)}$

(A) R

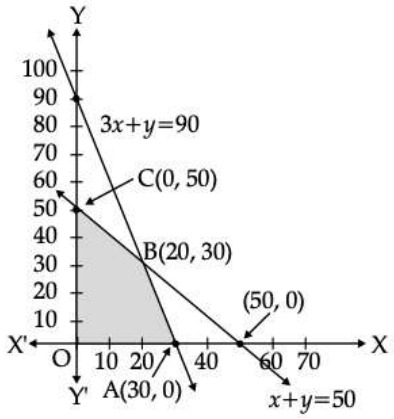
(B) $R - \{-11, -1, 1\}$

(C) $R - \{-1, 1\}$

(D) $R - \{11, 1\}$

Q35: In the given graph the feasible region for a LPP is shaded.

The objective function$Z = 4x + y$, will be maximise at point



(A) (0,0)

(B) (20,30)

(C) (0,50)

(D) (30,0)

Q36: Let A and B be sets and f: $A \times B \to B \times A$ such that $f(a, b) = (b, a)$ is

(A) bijective function

(B) surjective

(C) only onto

(D) None of these

Q37: If $y = a(\theta - \sin\theta), x = a(1 + \cos\theta)$ then $\frac{dy}{dx}$ will be

(A) $\frac{\cos\theta - 1}{\sin\theta}$

(B) $\frac{-\sin\theta}{1-\cos\theta}$

(C) $\frac{1-\cos\theta}{\sin\theta}$

(D) $\frac{-\sin\theta}{1+\sin\theta}$

Q38: If the function $f(x) = \begin{cases} \frac{4x^2-9}{2x-3}, & x \neq 3/2 \\ k, & x = 3/2 \end{cases}$ is continuous at $x = 3/2$, then k is:

(A) 4

(B) 5

(C) 6

(D) 8

Q39: $Z = 25x_1 + 20x_2$ subject to $x_1 \geq 0, x_2 \geq 0, x_1 + x_2 \geq 8, x_1 + 2x_2 \geq 12, 5x_1 + 2x_2 \geq 15$. The minimum value of Z occurs at

(A) (8,0)

(B) (52,154)

(C) (72,94)

(D) (0,8)

Q40: If $f(x) = 3x + x^3 - \frac{1}{8}\sin^2 x$, then the Function in $(0.5,3)$

(A) Increasing

(B) Decreasing

(C) Constant

(D) Neither increasing nor decreasing

SECTION-C

In this section, attempt any 8 questions.

Each question is of 1-mark weightage.

A dealer in rural area wishes to purchase a number of sewing machines. He has only Rs 5,760 to invest and has space for at most 20 items for storage. An electronic sewing machine cost him Rs 360 and a manually operated sewing machine Rs 240. He can sell an electronic sewing machine at a profit of Rs 22 and a manually operated machine at a profit of Rs 18. Assume that the electronic sewing machines he can sell is x and that of manually operated machines is y.

Q41: The objective function is

(A) Maximise $Z = 360x + 240y$

(B) Maximise $Z = 22x + 18y$

(C) Minimise $Z = 360x + 240y$

(D) Minimise $Z = 22x + 18y$

Q42: The maximum value of $\sin x \cdot \cos x$ is

(A) $\frac{1}{4}$

(B) $\frac{1}{2}$

(C) $\sqrt{2}$

(D) $2\sqrt{2}$

Q43: The maximum value of $\left(\frac{1}{x}\right)^x$ is :

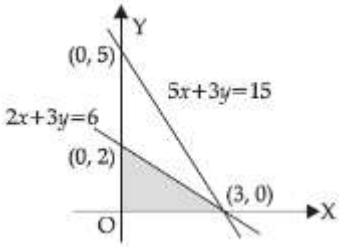
(A) e

(B) e^e

(C) $e^{1/e}$

(D) $\left(\frac{1}{e}\right)^{1/e}$

Q44: From the figure, which point is not belongs to feasible region



(A) (0,2)

(B) (3,0)

(C) (2,3)

(D) (0,0)

Q45: Which of the given values of x and y make the following pair of matrices equal

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

(A) $x = \frac{-1}{3}, y = 7$

(B) Not possible to find

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

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

Questions 46 - 50 are based on a Case-Study.

There are three families A, B and C.

The number of members in these families are given in the table below.

	Men	Women	Children
Family A	3	2	1
Family B	2	4	2
Family C	4	3	2

The daily expenses of each man , woman and child are respectively

Rs 200 , Rs 100 , Rs 50

Q46: The total daily expense of family A is

(A) 850

(B) 900

(C) 1,200

(D) 2,950

Q47: The total daily expense of family C is

(A) 850

(B) 900

(C) 1,200

(D) 2,950

Q48: The combined daily expense of all the women is

(A) 850

(B) 900

(C) 1,200

(D) 2,950

Q49: The family with highest expense is

(A) A

(B) B

(C) C

(D) All have same expense

Q50: The combined expense of men in family A and children in family C is

(A) 600

(B) 700

(C) 800

(D) 900