Sample Question Paper - 2
CLASS: XII
Session: 2021-22
Mathematics (Code-041)
Term - 1

Time Allowed: 1 hour and 30 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. There is no negative marking.
6. All questions carry equal marks.

Section A

Attempt any 16 questions

1. Let A = {1, 2, 3}, then the relation R = {(1, 1), (1, 2), (2, 1)} on A is **[1]**

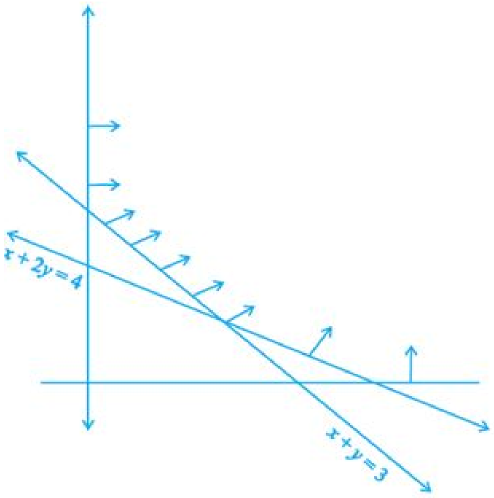
a) reflexive

b) symmetric

c) transitive

d) none of these

2. The feasible region for a LPP is shown in Figure. Evaluate Z = 4x + y at each of the corner points of this region. Find the minimum value of Z, if it exists **[1]**



a) Minimum value = 2

b) Minimum value = 5

c) Minimum value = 4

d) Minimum value = 3

3. Let $f(x) = \begin{cases} ax^2+1 & ,x>1 \\ x+1/2 & ,x\leq 1 \end{cases}$ Then, f(x) is derivable at x = 1, is **[1]**

a) a = 2

b) a = 0

c) a = 1

d) a = $\frac{1}{2}$

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4. If $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$ and $(A + B)^2 = (A^2 + B^2)$ then **[1]**

a) None of these

b) a = -2, b = 3

c) a = 1, b = 4

d) a = 2, b = -3

5. The optimal valuie of the objective function is attained at the points **[1]**

a) given by corner points of the feasible region

b) given by intersection of inequations with the axes only

c) None of these

d) given by intersection of inequations with x-axis only

6. If y = $\sec^{-1}\left(\frac{x^2+1}{x^2-1}\right)$ then $\frac{dy}{dx} = ?$ **[1]**

a) $\frac{-1}{(1+x^2)}$

b) None of these

c) $\frac{2}{(1+x^2)}$

d) $\frac{-2}{(1+x^2)}$

7. If A is a 3-rowed square matrix and I3AI = k|A| then k = ? **[1]**

a) 9

b) 1

c) 3

d) 27

8. The maximum value of $\frac{\log x}{x}$ in $0 < x < \infty$ is **[1]**

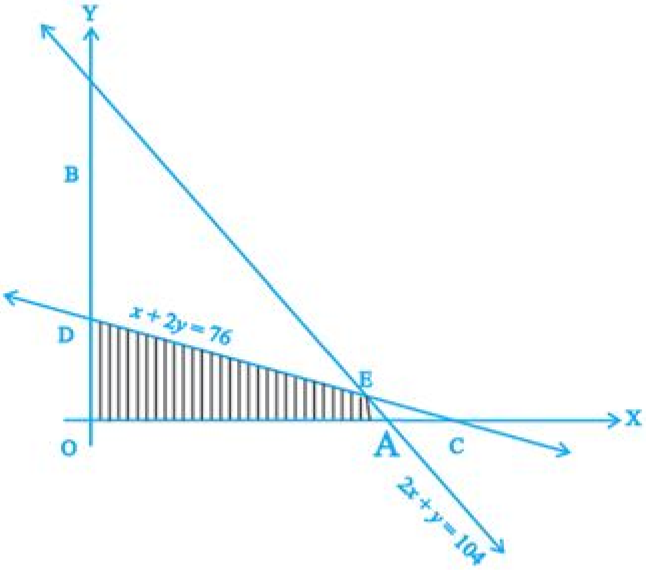
a) 0

b) none of these

c) – e

d) $\frac{1}{e}$

9. Determine the maximum value of Z = 3x + 4y if the feasible region (shaded) for a LPP is shown in Figure above. **[1]**



a) 226

b) 196

c) 216

d) 206

10. The number of all possible matrices of order 3×3 with each entry 0 or 1 is **[1]**

a) 81

b) none of these

c) 512

d) 18

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11. If $y=\sin^{-1}\left(\frac{1-x^2}{1+x^2}\right)$, then $\frac{dy}{dx}=$ **[1]**

a) $-\frac{2}{1+x^2}$

b) $\frac{2}{2-x^2}$

c) $\frac{2}{1+x^2}$

d) $\frac{1}{2-x^2}$

12. The corner points of the feasible region determined by the system of linear constraints are (0, 0), (0, 40), (20, 40), (60, 20), (60, 0). The objective function is Z = 4x + 3y. **[1]**

Compare the quantity in Column A and Column B

Column A	**Column B**
Maximum of Z	325
(A) The quantity in column A is greater	
(B) The quantity in column B is greater	
(C) The two quantities are equal	
(D) The relationship can not be determined on the basis of the information supplied	

a) The quantity in column A is greater

b) The quantity in column B is greater

c) The two quantities are equal

d) The relationship can not be determined on the basis of the information supplied

13. Tangents to the curve y= x^3 + 3x at x = -1 and x = 1 are **[1]**

a) intersecting at right angles

b) intersecting at an angle of 45^o.

c) intersecting obliquely but not at an angle of 45^o

d) parallel

14. If $y=x\sqrt{1-x^2}+\sin^{-1}x$,then $\frac{dy}{dx}$ is equal to **[1]**

a) $\frac{1}{\sqrt{1-x^2}}$

b) $\sqrt{1-x^2}$

c) $2\sqrt{1-x^2}$

d) None of these

15. If $y=\left(1+\frac{1}{x}\right)^x$, then $\frac{dy}{dx}=$ **[1]**

a) $\left(1+\frac{1}{x}\right)^x\log\left(1+\frac{1}{x}\right)$

b) $\left(x+\frac{1}{x}\right)^x\left\{\log\left(1+\frac{1}{x}\right)+\frac{1}{x+1}\right\}$

c) $\left(1+\frac{1}{x}\right)^x\left\{\log\left(1+\frac{1}{x}\right)-\frac{1}{x+1}\right\}$

d) $\left(x+\frac{1}{x}\right)^x\left\{\log(x+1)-\frac{x}{x+1}\right\}$

16. The equation of the tangent to the curve y = e^{2x} at the point (0, 1) is **[1]**

a) 1 – y = 2 x

b) y – 1 = 2 x

c) none of these

d) y + 1 = 2 x

17. If y = $\tan^{-1}\left(\frac{1-\cos x}{\sin x}\right)$ then $\frac{dy}{dx}=?$ **[1]**

a) 1

b) $\frac{1}{2}$

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c) -1 d) $\frac{-1}{2}$

18. The principal value of cosec^{-1} $\left(cosec\left(\frac{4\pi}{3}\right)\right)$ is **[1]**

a) $\frac{-\pi}{3}$ b) $\frac{\pi}{3}$

c) None of these d) $\frac{2\pi}{3}$

19. Let f(x) = |x - 1|, then **[1]**

a) f (x + y) = f (x) + f(y) b) f(|x|) = |f(x)|

c) $f(x^2) = (f(x))^2$ d) f (x) is not derivable at x = 1.

20. The function f(x) = 2log (x - 2) - x^2 + 4x + 1 increases on the interval **[1]**

a) $(1,2)\cup(3,\infty)$ b) (2 ,4)

c) $(-\infty,1)\cup(2,3)$ d) (1 , 3)

Section B

Attempt any 16 questions

21. Let R = { (x,y): $x^2 + y^2 = 1$ and x, y $\in$ R } be a relation in R. The relation R is **[1]**

a) symmetric b) anti – symmetric

c) reflexive d) transitive

22. The maximum value of f(x) = (x - 2) $(x - 3)^2$ is **[1]**

a) $\frac{7}{3}$ b) 0

c) $\frac{4}{27}$ d) 3

23. Maximize Z = 5x+3y , subject to constraints x + y ≤ 300 , 2x + y ≤ 360, x ≥ 0, y ≥ 0. **[1]**

a) 1020 b) 1050

c) 1040 d) 1030

24. Let f(x) $= \begin{cases} x\sin\frac{1}{x}, \text{ if } x \neq 0 \\ 0, \text{ when } x = 0 \end{cases}$ Then, which of the following is the true statement? **[1]**

a) f(x) is continuous at x = 0 b) f(x) is not defined at x = 0

c) $\lim_{x\to 0}$ f(x) does not exist d) f(x) is discontinuous at x = 0

25. If x = a $\cos^3\theta$, y = a $\sin^3\theta$, then $\sqrt{1+\left(\frac{dy}{dx}\right)^2} =$ **[1]**

a) sec θ b) $\tan^2\theta$

c) $\sec^2\theta$ d) |sec θ|

26. The principal value branch of $\sec^{-1}$ is **[1]**

a) $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$ b) $[0,\pi]-\left\{\frac{\pi}{2}\right\}$

c) (0, π) d) $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$-{0}

27. Which of the following functions from $A = \{x : -1 \leq x \leq 1\}$ to itself are bijections? **[1]**

a) h(x) = |x| b) k(x) = x^2

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c) $f(x) = \frac{x}{2}$ d) $g(x) = \sin\left(\frac{\pi x}{2}\right)$

28. If $\cos^{-1}\frac{x}{a} + \cos^{-1}\frac{y}{b} = a$, then $\frac{x^2}{a^2} - \frac{2xy}{ab}\cos\alpha + \frac{y^2}{b^2} =$ **[1]**

a) $\tan^2 a$ b) $\cos^2 a$

c) $\sin^2 a$ d) $\cot^2 a$

29. The minimum value of f(x) = $3x^4 - 8x^3 - 48x + 25$ on [0, 3] is **[1]**

a) 25 b) 16

c) -39 d) None of these

30. $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$ = ? **[1]**

a) 142 b) 16

c) -8 d) 8

31. If x sin (a + y) = sin y, then $\frac{dy}{dx}$ is equal to **[1]**

a) $\frac{\sin a}{\sin(a+y)}$ b) $\frac{\sin^2(a+y)}{\sin a}$

c) $\frac{\sin a}{\sin^2(a+y)}$ d) $\frac{\sin(a+y)}{\sin a}$

32. The differential coefficient of log (|log x|) w.r.t. log x is **[1]**

a) $\frac{1}{x|\log x|}$ b) $\frac{1}{x\log x}$

c) None of these d) $\frac{1}{\log x}$

33. If y = log $\left(x + \sqrt{x^2 + a^2}\right)$ then $\frac{dy}{dx}$ =? **[1]**

a) $\frac{1}{2(x+\sqrt{x^2+a^2})}$ b) $\frac{-1}{\sqrt{x^2+a^2}}$

c) $\frac{1}{\sqrt{x^2+a^2}}$ d) none of these

34. $\sin\left\{2\cos^{-1}\left(\frac{-3}{5}\right)\right\}$ is equal to **[1]**

a) $\frac{4}{5}$ b) $\frac{6}{25}$

c) $-\frac{24}{25}$ d) $\frac{24}{25}$

35. 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 Cofactors of a_{ij}, then the value of Δ is given by **[1]**

a) $a_{11} A_{31} + a_{12} A_{32} + a_{13} A_{33}$ b) $a_{21} A_{11} + a_{22} A_{12} + a_{23} A_{13}$

c) $a_{11} A_{11} + a_{21} A_{21} + a_{31} A_{31}$ d) $a_{11} A_{11} + a_{12} A_{21} + a_{13} A_{31}$

36. In a LPP, the linear inequalities or restrictions on the variables are called **[1]**

a) Limits b) Inequalities

c) Linear constraints d) Constraints

37. If A is a 3-rowed square matrix and IAI = 4 then adj (adj A) = ? **[1]**

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a) None of these

b) 64A

c) 4A

d) 16A

38. The angle of intersection of the curves xy = a^2 and x^2 - y^2 = $2a^2$ is **[1]**

a) 90^0

b) 45^0

c) 0^0

d) 30^0

39. If f(x) = a |sinx| + $be^{|x|}$ + c|x^3| and if f(x) is differentiable at x = 0, then **[1]**

a) c = 0, a = 0, b $\in$ R

b) b = c = 0, a $\in$ R

c) a = b = c = 0

d) a = 0, b = 0, c ϵ R

40. R = {(1, 1), (2, 2), (1, 2), (2, 1), (2, 3)} be a relation on A, then R is **[1]**

a) not anti symmetric

b) symmetric

c) anti symmetric

d) Reflexive

Section C

Attempt any 8 questions

41. If x > 1, then 2 $\tan^{-1}$ x + $\sin^{-1}$ $\left(\frac{2x}{1+x^2}\right)$ is equal to **[1]**

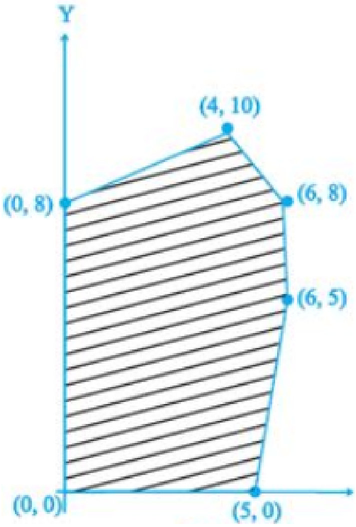
a) π

b) 4 $\tan^{-1}$ x

c) 0

d) $\frac{\pi}{5}$

42. The feasible solution for an LPP is shown in Figure. Let Z = 3x – 4y be the objective function. Minimum of Z occurs at **[1]**



a) (0, 8)

b) (0, 0)

c) (5, 0)

d) (4, 10)

43. The function f(x) = x – [x], where [.] denotes the greatest integer function is **[1]**

a) continuous at non-integer points only

b) continuous everywhere

c) continuous at integer points only

d) differentiable everywhere

44. If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, then value of x is **[1]**

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a) 3

b) ± 3

c) 6

d) ± 6

45. $f : R \rightarrow R: f(x) = x^3$ is **[1]**

a) many one and into

b) one one and onto

c) many one and onto

d) one one and into

Question No. 46 to 50 are based on the given text. Read the text carefully and answer the questions:

In a city, there are two factories A and B. Each factory produces sports clothes for boys and girls. There are three types of clothes produced in both the factories, type I, II and III. For boys, the number of units of types I, II, and III respectively are 80, 70, and 65 in factory A and 85, 65, and 72 are in factory B. For girls the number of units of types I, II, and III respectively are 80, 75, 90 in factory A and 50, 55, 80 are in factory B.

46. If P represents the matrix of number of units of each type produced by factory A for both boys and girls, then P is given by **[1]**

a) $$\begin{array}{cc} & \begin{array}{ccc} \text{I} & \text{II} & \text{III} \end{array} \\ \begin{array}{c} Boys \\ Girls \end{array} & \begin{bmatrix} 80 & 75 & 90 \\ 80 & 70 & 65 \end{bmatrix} \end{array}$$

b) $$\begin{array}{cc} & \begin{array}{cc} Boys & Girls \end{array} \\ \begin{array}{c} \text{I} \\ \text{II} \\ \text{III} \end{array} & \begin{bmatrix} 85 & 50 \\ 65 & 55 \\ 72 & 80 \end{bmatrix} \end{array}$$

c) $$\begin{array}{cc} & \begin{array}{cc} Boys & Girls \end{array} \\ \begin{array}{c} \text{I} \\ \text{II} \\ \text{III} \end{array} & \begin{bmatrix} 80 & 80 \\ 70 & 75 \\ 65 & 90 \end{bmatrix} \end{array}$$

d) $$\begin{array}{cc} & \begin{array}{ccc} \text{I} & \text{II} & \text{III} \end{array} \\ \begin{array}{c} Boys \\ Girls \end{array} & \begin{bmatrix} 50 & 55 & 80 \\ 85 & 65 & 72 \end{bmatrix} \end{array}$$

47. If Q represents the matrix of number of units of each type produced by factory B for both boys and girls, then Q is given by **[1]**

a) $$\begin{array}{cc} & \begin{array}{cc} Boys & Girls \end{array} \\ \begin{array}{c} \text{I} \\ \text{II} \\ \text{III} \end{array} & \begin{bmatrix} 80 & 80 \\ 70 & 75 \\ 65 & 90 \end{bmatrix} \end{array}$$

b) $$\begin{array}{cc} & \begin{array}{ccc} \text{I} & \text{II} & \text{III} \end{array} \\ \begin{array}{c} Boys \\ Girls \end{array} & \begin{bmatrix} 80 & 75 & 90 \\ 80 & 70 & 65 \end{bmatrix} \end{array}$$

c) $$\begin{array}{cc} & \begin{array}{cc} Boys & Girls \end{array} \\ \begin{array}{c} \text{I} \\ \text{II} \\ \text{III} \end{array} & \begin{bmatrix} 85 & 50 \\ 65 & 55 \\ 72 & 80 \end{bmatrix} \end{array}$$

d) $$\begin{array}{cc} & \begin{array}{ccc} \text{I} & \text{II} & \text{III} \end{array} \\ \begin{array}{c} Boys \\ Girls \end{array} & \begin{bmatrix} 50 & 55 & 80 \\ 85 & 65 & 72 \end{bmatrix} \end{array}$$

48. The total production of sports clothes of each type for boys is given by the matrix **[1]**

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a) $\begin{array}{ccccc} & \text{I} & \text{II} & \text{III} & \\ \big[& 137 & 135 & 165 & \big] \end{array}$

b) $\begin{array}{ccccc} & \text{I} & \text{II} & \text{III} & \\ \big[& 130 & 165 & 137 & \big] \end{array}$

c) $\begin{array}{ccccc} & \text{I} & \text{II} & \text{III} & \\ \big[& 165 & 135 & 137 & \big] \end{array}$

d) $\begin{array}{ccccc} & \text{I} & \text{II} & \text{III} & \\ \big[& 165 & 130 & 137 & \big] \end{array}$

49. The total production of sports clothes of each type for girls is given by the matrix **[1]**

a) none of these

b) $\begin{array}{ccccc} & \text{I} & \text{II} & \text{III} & \\ \big[& 130 & 170 & 130 & \big] \end{array}$

c) $\begin{array}{ccccc} & \text{I} & \text{II} & \text{III} & \\ \big[& 170 & 130 & 170 & \big] \end{array}$

d) $\begin{array}{ccccc} & \text{I} & \text{II} & \text{III} & \\ \big[& 130 & 130 & 170 & \big] \end{array}$

50. Let R be a 3×2 matrix that represent the total production of sports clothes of each type for boys and girls, then transpose of R is **[1]**

a) $\begin{bmatrix} 130 & 168 \\ 130 & 135 \\ 170 & 137 \end{bmatrix}$

b) $\begin{bmatrix} 130 & 130 & 170 \\ 165 & 135 & 138 \end{bmatrix}$

c) $\begin{bmatrix} 165 & 132 \\ 135 & 130 \\ 137 & 170 \end{bmatrix}$

d) $\begin{bmatrix} 165 & 135 & 137 \\ 130 & 130 & 170 \end{bmatrix}$

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Solution

Section A

1. **(b)** symmetric

   Explanation: A relation R on a nonempty set A is said to be symmetric iff xRy $\Leftrightarrow$ yRx, for all x, y $\in$ R
   Clearly, (1, 2), and (2, 1) both lie in R. Therefore, R is symmetric.

2. **(a)** Minimum value = 2

   Explanation:

Corner points	Z = 4x + y
(0, 2)	2
(0,3)	3
(2,1)	9

   Hence the minimum value is 2

3. **(d)** a = $\frac{1}{2}$

   Explanation: Given function $f(x)=\left\{\begin{array}{c}ax^2+1, x>1\\ x+\frac{1}{2}, x\leq 1\end{array}\right\}$ and f(x) is derivable at x = 1.

   $\Rightarrow$ LHD (at x = 1) = RHD (at x = 1)

   $\Rightarrow \lim\limits_{x\to 1^-}\frac{f(x)-f(1)}{x-1}=\lim\limits_{x\to 1^+}\frac{f(x)-f(1)}{x-1}$

   $\Rightarrow \lim\limits_{h\to 0}\frac{f(1-h)-f(1)}{1-h-1}=\lim\limits_{h\to 0}\frac{f(1+h)-f(1)}{1+h-1}$

   $\Rightarrow \lim\limits_{h\to 0}\frac{\left(1-h+\frac{1}{2}\right)-\frac{3}{2}}{-h}=\lim\limits_{h\to 0}\frac{a(1+h)^2+1-\frac{3}{2}}{h}$

   $\Rightarrow$ a $-\frac{1}{2}=0$

   $\Rightarrow a=\frac{1}{2}$

4. **(c)** a = 1, b = 4

   Explanation: $A=\begin{pmatrix}1 & -1\\ 2 & -1\end{pmatrix} B=\begin{pmatrix}a & 1\\ b & -1\end{pmatrix}$

   $A+B=\begin{pmatrix}1+a & 0\\ 2+b & -2\end{pmatrix}$

   $(A+B)^2=\begin{pmatrix}1+a & 0\\ 2+b & -2\end{pmatrix}\begin{pmatrix}1+a & 0\\ 2+b & -2\end{pmatrix}$

   $=\begin{pmatrix}(1+a)^2 & 0\\ (2+b)(1+a)-4-2b & -4\end{pmatrix}$

   $=\begin{pmatrix}(1+a)^2 & 0\\ 2+2a+b+ab-4-2b & 4\end{pmatrix}$

   $=\begin{pmatrix}(1+a)^2 & 0\\ 2a+ab-b-2 & 4\end{pmatrix}$

   $A^2=\begin{pmatrix}1 & -1\\ 2 & -1\end{pmatrix}\begin{pmatrix}1 & -1\\ 2 & -1\end{pmatrix}$

   $=\begin{pmatrix}-1 & 0\\ 0 & -1\end{pmatrix}$

   $\mathrm{B}^2=\begin{pmatrix}\mathbf{a} & \mathbf{1}\\ \mathbf{b} & -\mathbf{1}\end{pmatrix}\begin{pmatrix}\mathbf{a} & \mathbf{1}\\ \mathbf{b} & -\mathbf{1}\end{pmatrix}$

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$$= \begin{pmatrix} a^2+b & a-1 \\ ab-b & b+1 \end{pmatrix}$$

Given that; (A + B)^2 = (A^2 + B^2)

$$\Rightarrow \begin{pmatrix} (1+a)^2 & 0 \\ 2a+ab-b-2 & 4 \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix} + \begin{pmatrix} a^2+b & a-1 \\ ab-b & b+1 \end{pmatrix}$$

$$= \begin{pmatrix} -1+a^2+b & a-1 \\ ab-b & b \end{pmatrix}$$

By comparison

a - 1 = 0

a = 1

b = 4

5. **(a)** given by corner points of the feasible region

   Explanation: It is known that the optimal value of the objective function is attained at any of the corner point. Thus, the optimal value of the objective function is attained at the points given by corner points of the feasible region.

6. **(d)** $\frac{-2}{(1+x^2)}$

   Explanation: Given that $y = \sec^{-1}\left(\frac{x^2+1}{x^2-1}\right)$

   $\Rightarrow \sec y = \frac{x^2+1}{x^2-1}$

   Since tan^{2}x = sec^{2}x -1, thus

   $\tan^2 y = \left(\frac{x^2+1}{x^2-1}\right)^2 - 1 = \frac{4x^2}{(x^2-1)^2}$

   Hence, $\tan y = -\frac{2x}{1-x^2}$ or $y = \tan^{-1}\left(-\frac{2x}{1-x^2}\right)$

   Let $x = \tan\theta \Rightarrow \theta = \tan^{-1} x$

   Hence, $y = \tan^{-1}\left(-\frac{2\tan\theta}{1-\tan^2\theta}\right)$

   Using $\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$, we obtain

   $y = \tan^{-1}(-\tan 2\theta)$

   Uisng -tan x = tan(-x), we obtain

   y = tan^{-1} (tan(-2θ) = -2θ = -2tan^{-1} x

   Differentiating with respect to x, we obtain

   $\frac{dy}{dx} = \frac{-2}{1+x^2}$

7. **(d)** 27

   Explanation: Since the matrix is of order 3 so 3 will be taken common from each row or column.

   So, k = 27

8. **(d)** $\frac{1}{e}$

   Explanation: Consider f(x) = $\frac{logx}{x}$

   Then, f'(x) ==$\frac{x.\frac{1}{x} - logx.1}{x^2} \quad = \frac{1-logx}{x^2}$

   For maximum or minimum values of x we have f'(x) = 0

   f'(x) = 0 $\Rightarrow$ (1 - logx) = 0

   $\Rightarrow$ logx = 1 $\Rightarrow$ x = e.

   Now, f'(x) $= \frac{x^2.\frac{-1}{x} - (1-logx)2x}{x^4} = \left[\frac{-3+2logx}{x^3}\right]$

   f''(x) at $at \quad x = e = \frac{-3}{e^3} < 0$

   Therefore f(x) is maximum at x = e and the max. value$= \frac{loge}{e} = \frac{1}{e}$

9. **(b)** 196

   Explanation: Here , maximize Z = 3x+4y ,

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Corner points	**Z = 3x + 4 y**
C(0 ,38)	132
B (52 ,0)	156
D(44 , 16)	196

Hence the maximum value is 196

10. **(c)** 512

Explanation: $2^{3x3} = 2^9 = 512$.
The number of elements in a 3 × 3 matrix is the product 3 × 3 = 9.
Each element can either be a 0 or a 1.

Given this, the total possible matrices that can be selected is $2^9 = 512$

11. **(a)** $-\frac{2}{1+x^2}$

Explanation: $y=\sin^{-1}\left(\frac{1-x^2}{1+x^2}\right)$
Put, $x=\tan\theta \Rightarrow \theta=\tan^{-1}x$
$y=\sin^{-1}\left(\frac{1-\tan^2\theta}{1+\tan^2\theta}\right)$
$y = \sin^{-1}(\cos 2\theta)$
$y=\sin^{-1}\left[\sin\left(\frac{\pi}{2}-2\theta\right)\right]$
$y=\frac{\pi}{2}-2\theta$
$y=\frac{\pi}{2}-2\tan^{-1}x$
$\frac{dy}{dx}=-\frac{2}{1+x^2}$

12. **(b)** The quantity in column B is greater
Explanation:

Corner Points	Corresponding Value of Z = 4x + 3y
(0, 0)	0
(0, 40)	120
(20, 40)	200
(60, 20)	300 **(Maximum)**
(60, 0)	240

So, maximum value of Z = 300 < 325.
Therefore, the quantity in column B is greater.
Which is the required solution.

13. **(d)** parallel

Explanation: Given $y = x^3 + 3x$
$\Rightarrow \frac{dy}{dx}=3x^2+3$
Slope of tangent at x = 1 = 6 and
Slope of tangent at x = -1 = 6
Hence, the two tangents are parallel.

14. **(c)** $2\sqrt{1-x^2}$

Explanation: $y=x\sqrt{1-x^2}+\sin^{-1}(x)$
$\Rightarrow \frac{dy}{dx}=x\left\{\frac{1}{2\sqrt{1-x^2}}(-2x)\right\}+\sqrt{1-x^2}+\frac{1}{\sqrt{1-x^2}}$
$\Rightarrow \frac{dy}{dx}=\frac{-x^2}{\sqrt{1-x^2}}+\sqrt{1-x^2}+\frac{1}{\sqrt{1-x^2}}$
$\Rightarrow \frac{dy}{dx}=\frac{-x^2+1-x^2+1}{\sqrt{1-x^2}}$

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$\Rightarrow \frac{dy}{dx} = \frac{-2x^2+2}{\sqrt{1-x^2}}$

$\Rightarrow \frac{dy}{dx} = 2\sqrt{1-x^2}$

15. **(c)** $\left(1+\frac{1}{x}\right)^x \left\{\log\left(1+\frac{1}{x}\right) - \frac{1}{x+1}\right\}$

Explanation: $y = \left(1+\frac{1}{x}\right)^x$

Taking log on both sides,

$\log y = \log\left(1+\frac{1}{x}\right)^x$

$\log y = x\log\left(1+\frac{1}{x}\right)$

Differentiate with respect to x,

$\frac{1}{y}\frac{dy}{dx} = x \times \frac{1}{1+\frac{1}{x}} \times \frac{-1}{x^2} + \log\left(1+\frac{1}{x}\right)$

$\frac{1}{y}\frac{dy}{dx} = \frac{x^2}{x+1} \times \frac{-1}{x^2} + \log\left(1+\frac{1}{x}\right)$

$\frac{dy}{dx} = y\left(\frac{-1}{x+1} + \log\left(1+\frac{1}{x}\right)\right)$

$\frac{dy}{dx} = \left(1+\frac{1}{x}\right)^x\left(\frac{-1}{x-1} + \log\left(1+\frac{1}{x}\right)\right)$

$\frac{dy}{dx} = \left(1+\frac{1}{x}\right)^x\left(\log\left(1+\frac{1}{x}\right) - \frac{1}{x+1}\right)$

16. **(b)** y – 1 = 2 x

Explanation: $y = e^{2x}$

$\Rightarrow \frac{dy}{dx} = 2e^{2x}$

$\Rightarrow \frac{dy}{dx} \quad at \quad (0,1) = 2$

⇒ Slope of tangent = m = 2

Hence , equation of tangent is y - y_1 = m(x - x_1)

⇒ y - 1 = 2x

17. **(b)** $\frac{1}{2}$

Explanation: Given that y = $\tan^{-1}\left(\frac{1-\cos x}{\sin x}\right)$

Using 1 - cos x = $2\sin^2\frac{x}{2}$ and Using sin x = 2 sin x $\frac{x}{2}$cos $\frac{x}{2}$, we obtain

y = $\tan^{-1}\left(\frac{2\sin^2\frac{x}{2}}{2\sin\frac{x}{2}\cos\frac{x}{2}}\right)$ or y = $\tan^{-1}\tan\frac{x}{2}$

$y = \frac{x}{2}$

Differentiating with respect to x, we obtain

$\frac{dy}{dx} = \frac{1}{2}$

18. **(a)** $\frac{-\pi}{3}$

Explanation: Let x = $\operatorname{cosec}^{-1}\left(cosec\left(\frac{4\pi}{3}\right)\right)$

⇒ cosec x = cosec $\left(\frac{4\pi}{3}\right)$

Here range of principle value of cosec is $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

$\Rightarrow x = \frac{4\pi}{3} \notin \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

Hence, for all values of x in range $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$, the value of

$\operatorname{cosec}^{-1}\left(cosec\left(\frac{4\pi}{3}\right)\right)$ is

⇒ cosec x = cosec $\left(\pi + \frac{\pi}{3}\right)$($\because$ cosec$\left(\frac{4\pi}{3}\right)$ = cosec $\left(\pi + \frac{\pi}{3}\right)$)

⇒ cosec x = cosec $\left(-\frac{\pi}{3}\right)$ ($\because$ cosec $(\pi + \theta)$= cosec $(-\theta)$)

$\Rightarrow x = -\frac{\pi}{3}$

19. **(d)** f (x) is not derivable at x = 1.

Explanation: Here, $f(x) = |x-1| \ x \in R$. So $f(x)$ is not derivable when x - 1 = 0 i.e. at x = 1

20. **(c)** $(-\infty, 1) \cup (2, 3)$

Explanation: Given that;

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$f(x) = 2\log(x - 2) - x^2 + 4x + 1$

$f'(x) = \frac{2}{(x-2)} - 2x + 4$

$= \frac{2}{(x-2)} - 2(x - 2)$

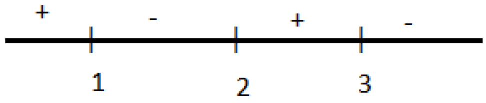
$= \frac{2(1-(x-2)^2)}{(x-2)}$

$= \frac{2(1-x+2)(1+x-2)}{(x-2)}$

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

Critical points are;

1, 2 and 3



F(x) is increasing in $(-\infty, 1) \cup (2, 3)$

Section B

21. **(a)** symmetric

Explanation: A relation R on a non empty set A is said to be symmetric if $xRy \Leftrightarrow yRx$, for all $x,y \in R$.

Clearly, $x^2 + y^2 = 1$ is same as $y^2 + x^2 = 1$ for all $x,y \in R$. Therefore, R is symmetric.

22. **(c)** $\frac{4}{27}$

Explanation: Here,it is given function $ff(x) = (x - 2)(x - 3)^2$

$f(x) = (x - 2)(x^2 - 6x + 9)$

$f(x) = x^3 - 8x^2 + 21x + 18$

$f'(x) = 3x^2 - 16x + 21$

$f''(x) = 6x - 16$

For maximum or minimum value $f'(x) = 0$

$\therefore 3x^2 - 9x - 7x + 21 = 0$

$\Rightarrow 3x(x - 3) - 7(x - 3) = 0$

$\Rightarrow x = 3$ or $x = \frac{7}{3}$

$f''(c)$ at $x = 3$

$\therefore f''(x) = 2$

$f''(x) > 0$ it is decreasing and has minimum value at $x = 3$

at $x = \frac{7}{3}$

$f''(x) = -2$

$f''(x) < 0$ it is increasing and has maximum value at $x = \frac{7}{3}$

Putting, $x = \frac{7}{3}$ in f(x) we obtain,

$\Rightarrow \left(\frac{7}{3} - 2\right)\left(\frac{7}{3} - 3\right)^2$

$= \left(\frac{1}{3}\right)\left(\frac{-2}{3}\right)^2$

$= \frac{4}{27}$

23. **(a)** 1020

Explanation: Here , Maximize $Z = 5x+3y$, subject to constraints $x + y \le 300$, $2x + y \le 360$, $x \ge 0$, $y \ge 0$.

Corner points	Z = 5x +3 y
P(0 ,300)	900
Q(180 , 0)	900
R(60, 240)	1020......................(Max.)
S(0 , 0)	0

Hence, the maximum value is 1020

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24. **(a)** f(x) is continuous at x = 0

Explanation: Left hand limit, we get

$\Rightarrow \lim_{x \to 0^-} f(x)$

$\Rightarrow \lim_{h \to 0} f(0-h)$

$\Rightarrow \lim_{h \to 0} h \cdot \sin\left(\frac{-1}{h}\right)$

$\Rightarrow \lim_{h \to 0} -h \cdot \frac{\sin\left(\frac{-1}{h}\right)}{-\frac{1}{h}} \times \frac{-1}{h} = 1$

Right hand limit, we get

$\Rightarrow \lim_{x \to 0^+} f(x)$

$\Rightarrow \lim_{h \to 0} f(0+h)$

$\Rightarrow \lim_{h \to 0} h \cdot \sin\left(\frac{1}{h}\right)$

$\Rightarrow \lim_{h \to 0} h \cdot \frac{\sin\left(\frac{1}{h}\right)}{\frac{1}{h}} \times \frac{1}{h}$

= 1

As L.H.L = R.H.L

F(x) is continuous.

25. **(d)** $|\sec \theta|$

Explanation: $x = a\cos^3\theta \Rightarrow \cos^2\theta = \left(\frac{x}{a}\right)^{\frac{2}{3}}$

$y = a\sin^3\theta \Rightarrow \sin^2\theta = \left(\frac{y}{a}\right)^{\frac{2}{3}}$

We know that

$\cos^2\theta + \sin^2\theta = 1$

$\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{a}\right)^{\frac{2}{3}} = 1$

$x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{x^3}$

Differentiating with respect to x,

$\frac{2}{3}x^{\frac{-1}{3}} + \frac{2}{3}y^{\frac{-1}{3}}\frac{dy}{dx} = 0$

$\frac{dy}{dx} = \left(\frac{y}{x}\right)^{\frac{1}{3}}$

$\sqrt{1+\left(\frac{dy}{dx}\right)^2} = \sqrt{1+\left[\left(\frac{y}{x}\right)^{\frac{1}{3}}\right]^2}$

$\sqrt{1+\left(\frac{dy}{dx}\right)^2} = \sqrt{1+\left[\left(\frac{\sin^3\theta}{\cos^3\theta}\right)^{\frac{1}{3}}\right]^2}$

$\sqrt{1+\left(\frac{dy}{dx}\right)^2} = |\sec\theta|.$

Which is the required solution.

26. **(b)** $[0, \pi] - \left\{\frac{\pi}{2}\right\}$

Explanation: $[0, \pi] - \left\{\frac{\pi}{2}\right\}$

27. **(d)** $g(x) = \sin\left(\frac{\pi x}{2}\right)$

Explanation: Given that $A = \{x : -1 \leq x \leq 1\}$

$f(x) = \frac{x}{2}$

It is one-one but not onto.

$g(x) = \sin\left(\frac{\pi x}{2}\right)$

It is bijective as it is one-one and onto with range [-1, 1].

h(x) = |x|

It is not one-one because h(-1) = 1 and h(1) = 1.

k(x) = x^2

It is not one-one because k(-1) = 1 and k(1) = 1.

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28. **(c)** $\sin^2 a$

Explanation: $\cos^{-1} x + \cos^{-1} y = \cos^{-1}\left(xy - \sqrt{1-x^2}\sqrt{1-y^2}\right)$

since, $\cos^{-1}\frac{x}{a} + \cos^{-1}\frac{y}{b} = \alpha$ (given)

$$\Rightarrow \cos^{-1}\left(\frac{x}{a} \times \frac{y}{b} - \sqrt{1-\frac{x^2}{a^2}}\sqrt{1-\frac{y^2}{a^2}}\right) = \alpha$$

$$\Rightarrow \frac{x}{a} \times \frac{y}{b} - \sqrt{1-\frac{x^2}{a^2}}\sqrt{1-\frac{y^2}{a^2}} = \cos\alpha$$

$$\Rightarrow \frac{x}{a} \times \frac{y}{b} - \cos\alpha = \sqrt{1-\frac{x^2}{a^2}}\sqrt{1-\frac{y^2}{a^2}}$$

Squaring on both sides,

$$\Rightarrow \frac{x^2y^2}{a^2b^2} + \cos^2\alpha - \frac{2xy}{ab}\cos\alpha = \left(1-\frac{x^2}{a^2}\right)\left(1-\frac{y^2}{a^2}\right)$$

$$\Rightarrow \frac{x^2y^2}{a^2b^2} + \cos^2\alpha - \frac{2xy}{ab}\cos\alpha = 1 - \frac{x^2}{a^2} - \frac{y^2}{a^2} + \frac{x^2y^2}{a^2b^2}$$

$$\Rightarrow \frac{x^2}{a^2} + \frac{y^2}{a^2} - \frac{2xy}{ab}\cos\alpha = 1 - \cos^2 a$$

$$\Rightarrow \frac{x^2}{a^2} + \frac{y^2}{a^2} - \frac{2xy}{ab}\cos a = \sin^2 a$$

29. **(c)** -39

Explanation: Given function,

$f(x) = 3x^4 - 8x^3 - 48x + 25$

$F'(x) = 12x^3 - 24x^2 - 48 = 0$

$F'(x) = 12(x^3 - 2x^2 - 4) = 0$

Differentiating again, we obtain

$F''(x) = 3x^2 - 4x = 0$

$x(3x - 4) = 0$

$x = 0$ or $x = \frac{4}{3}$

Putting the value in equation, we obtain

$f(x) = -39$

30. **(c)** -8

Explanation: By evaluating determinant along 1st row we get value of det. = -8

31. **(b)** $\frac{\sin^2(a+y)}{\sin a}$

Explanation: $x\sin(a+y) = \sin y \Rightarrow x = \frac{\sin y}{\sin(a+y)}$

$$\Rightarrow \frac{dx}{dy} = \frac{\sin(a+y)\cos y - \sin y\cos(a+y)}{\sin^2(a+y)}$$

$$= \frac{\sin(a+y-y)}{\sin^2(a+y)} = \frac{\text{sina}}{\sin^2(a+y)}$$

$$\Rightarrow \frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$$

32. **(d)** $\frac{1}{\log x}$

Explanation: Let y = log(|logx|) and z = logx, then we have; $\frac{dy}{dz} = \frac{\frac{dy}{dx}}{\frac{dz}{dx}} = \left(\frac{1}{\log x} \cdot \frac{1}{x}\right) / \left(\frac{1}{x}\right) \Rightarrow \frac{1}{\log x}$

33. **(c)** $\frac{1}{\sqrt{x^2+a^2}}$

Explanation: Given that $y = \log_e\left(x + \sqrt{x^2+a^2}\right)$

Differentiating with respect to x, we obtain

$$\frac{dy}{dx} = \frac{1}{x+\sqrt{x^2+a^2}}\left(1 + \frac{1}{2\sqrt{x^2+a^2}} \times 2x\right)$$

$$\frac{dy}{dx} = \frac{1}{x+\sqrt{x^2+a^2}} \times \frac{x+\sqrt{x^2+a^2}}{\sqrt{x^2+a^2}} = \frac{1}{\sqrt{x^2+a^2}}$$

34. **(c)** $-\frac{24}{25}$

Explanation: To find $\sin\left\{2\cos^{-1}\left(\frac{-3}{5}\right)\right\}$

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Let, $\cos^{-1}\left(\frac{-3}{5}\right) = y$

$\Rightarrow \frac{-3}{5} = \cos y$

$\Rightarrow \sin y = \sqrt{1 - \cos^2 y}$

$\Rightarrow \sin y = \sqrt{1 - \left(\frac{-3}{5}\right)^2}$

$\Rightarrow \sin y = \frac{4}{5}$

$\sin \{2 \cos^{-1} \left(\frac{-3}{5}\right)\} = \sin 2y$

$\Rightarrow 2 \sin \{2 \cos^{-1} \left(\frac{-3}{5}\right)\} = 2 \sin y \cos y$

$\Rightarrow \sin\left\{2\cos^{-1}\left(\frac{-3}{5}\right)\right\} = 2 \times \frac{4}{5} \times \frac{-3}{5}$

$\Rightarrow \sin\left\{2\cos^{-1}\left(\frac{-3}{5}\right)\right\} = \frac{-24}{25}$

35. **(c)** $a_{11} A_{11} + a_{21} A_{21} + a_{31} A_{31}$

Explanation: $\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$

Expanding along Column 1

$\Delta = (-1)^{1+1} \times a_{11} \times \begin{vmatrix} a_{22} & a_{23} \\ a_{32} & a_{33} \end{vmatrix} + (-1)^{2+1} \times a_{21} \times \begin{vmatrix} a_{12} & a_{13} \\ a_{32} & a_{33} \end{vmatrix} + (-1)^{3+1} \times a_{31} \times \begin{vmatrix} a_{12} & a_{13} \\ a_{22} & a_{23} \end{vmatrix}$

$\Delta = a_{11}A_{11} + a_{21}A_{21} + a_{31}A_{31}$

36. **(c)** Linear constraints

Explanation: In a LPP, the linear inequalities or restrictions on the variables are called Linear constraints.

37. **(c)** 4A

Explanation: The property states that

adj(adj A) = $|A|^{n-2}.A$

Here n = 2

adj(adj A) = $|4|^{3-2}.A$

= 4A

38. **(a)** 90^o

Explanation: $xy = a^2$ and $x^2 - y^2 = 2a^2$

$x\frac{dy}{dx} + y = 0$ and $2x - 2y\frac{dy}{dx} = 0$

$\Rightarrow \frac{dy}{dx} = \frac{-y}{x}$ and $\frac{dy}{dx} = \frac{x}{y}$

We can see clearly that product of the slopes of tangents is -1.

Hence, the angle between the two tangents is 90^o.

39. **(d)** a = 0, b = 0, c ϵ R

Explanation: Given that $f(x) = a\,|\sin x| + b\,e^{|x|} + c|x^3|$ and f(x) is differentiable at x = 0.

⇒ LHD = RHD at x = 0.

$\Rightarrow \lim\limits_{x \to 0^-} \frac{f(x)-f(0)}{x-0} = \lim\limits_{x \to 0^+} \frac{f(x)-f(0)}{x-0}$

$\Rightarrow \lim\limits_{h \to 0} \frac{f(0-h)-f(0)}{0-h-0} = \lim\limits_{h \to 0} \frac{f(0+h)-f(0)}{0+h-0}$

$\Rightarrow \lim\limits_{\mathrm{h} \to 0} \frac{-\mathrm{asin}(-\mathrm{h})+\mathrm{be}^{\mathrm{h}}-\mathrm{ch}^3-\mathrm{b}}{0-\mathrm{h}} = \lim \frac{\mathrm{asin(h)}+\mathrm{be}^{\mathrm{h}}+\mathrm{ch}^3-\mathrm{b}}{0+\mathrm{h}}$

$\Rightarrow \lim\limits_{\mathrm{h} \to 0} \frac{\mathrm{acosh}+\mathrm{be}^{\mathrm{h}}+3\mathrm{ch}^2}{-1} = \lim \frac{\mathrm{a\,cosh}+\mathrm{be}^{\mathrm{h}}+3\mathrm{ch}^2}{\mathrm{h} \to 0}$

By L'Hospital Rule,

$\Rightarrow -(a + b) = a + b$

$\Rightarrow -2(a + b) = 0$

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$\Rightarrow$ a + b = 0

This is the value for all c $\in$ R

40. **(a)** not anti symmetric

Explanation: A relation R on a non empty set A is said to be reflexive if xRx for all x $\in$ R , Therefore , R is not reflexive.

A relation R on a non empty set A is said to be symmetric if xRy $\Leftrightarrow$ yRx, for all x , y $\in$ R. Therefore, R is not symmetric.

A relation R on a non empty set A is said to be antisymmetric if xRy and yRx $\Rightarrow$ x = y , for all x , y $\in$ R. Therefore, R is not antisymmetric.

Section C

41. **(b)** 4 tan^{-1} x

Explanation: 2 tan^{-1} x + sin^{-1} $\left(\frac{2x}{1+x^2}\right)$

Let, x = tan $\theta \Rightarrow \theta$ = tan^{-1} x

$\Rightarrow$ 2 tan^{-1} x + sin^{-1} (sin2θ)

$\Rightarrow$ 2θ + 2θ

$\Rightarrow$ 4θ

$\Rightarrow$ 4 tan^{-1} x

42. **(a)** (0, 8)

Explanation:

Corner points	Z = 3x - 4y
(0, 0)	0
(5,0)	15
(6,8)	-14
(6 ,5)	-2
(4,10)	-28
(0,8)	-32(Min.)

The minimum value occurs at (0,8)

43. **(a)** continuous at non-integer points only

Explanation: Given function f(x) = x – [x]

For any integer n,

$$f(x) = \left\{\begin{array}{c} x - (n - 1), n - 1 \leq x < n \\ 0, x = n \\ x - n, n \leq x < n + 1 \end{array}\right\}$$

LHL: $\lim\limits_{x \to n^-}$ x - n + 1 = n - n + 1 = 1

RHL: $\lim\limits_{x \to 1^+}$ x - n = n - n = 0

Hence, f(x) is not continuous at integer points.

$\therefore$ Given function is continuous on non-integer points only.

44. **(d)** $\pm$6

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

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

$\Rightarrow$ 2x^2 = 72

$\Rightarrow$ x^2 = 36

$\Rightarrow$ x = $\pm$6

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45. **(d)** one one and into

Explanation: f: R → R: $f(x) = x^3$

For One-One function

Let p, q be two arbitrary elements in R

then, f(p) = f(q)

$\Rightarrow P^3 = q^3$

$\Rightarrow p = q$

Thus, f(x) is one-one function.

For Onto function

Let v be an arbitrary element of R (co-domian)

Then, f(x) = v

$x^3 = v$

$\Rightarrow x = \sqrt[3]{v}$

Since v ∈ N

If v = 2, $\sqrt[3]{v} = 1.260$, which is not possible as x ∈ R

Thus, f(x) is not onto function. It is into function.

46. **(c)** $\begin{array}{cc} & \begin{array}{cc} \textit{Boys} & \textit{Girls} \end{array} \\ \begin{array}{c} \text{I} \\ \text{II} \\ \text{III} \end{array} & \begin{bmatrix} 80 & 80 \\ 70 & 75 \\ 65 & 90 \end{bmatrix} \end{array}$

Explanation: In factory A, number of units of types I, II and III for boys are 80, 70, 65 respectively and for girls number of units of types I, II and III are 80, 75,90 respectively.

$$\therefore P = \begin{array}{cc} & \begin{array}{cc} \textit{Boys} & \textit{Girls} \end{array} \\ \begin{array}{c} \text{I} \\ \text{II} \\ \text{III} \end{array} & \begin{bmatrix} 80 & 80 \\ 70 & 75 \\ 65 & 90 \end{bmatrix} \end{array}$$

47. **(c)** $\begin{array}{cc} & \begin{array}{cc} \textit{Boys} & \textit{Girls} \end{array} \\ \begin{array}{c} \text{I} \\ \text{II} \\ \text{III} \end{array} & \begin{bmatrix} 85 & 50 \\ 65 & 55 \\ 72 & 80 \end{bmatrix} \end{array}$

Explanation: In factory B, number of units of types I, II and III for boys are 85, 65, 72 respectively and for girls

number of units of types I, II and III are 50, 55, 80 respectively.

$$\therefore Q = \begin{array}{cc} & \begin{array}{cc} \textit{Boys} & \textit{Girls} \end{array} \\ \begin{array}{c} \text{I} \\ \text{II} \\ \text{III} \end{array} & \begin{bmatrix} 85 & 50 \\ 65 & 55 \\ 72 & 80 \end{bmatrix} \end{array}$$

48. **(c)** $\begin{array}{ccc} \text{I} & \text{II} & \text{III} \\ \end{array}$ $\begin{bmatrix} 165 & 135 & 137 \end{bmatrix}$

Explanation: Let X be the matrix that represent the number of units of each type produced by factory A for boys,

and Y be the matrix that represent the number of units of each type produced by factory B for boys.

Then, $X = \begin{array}{c} \begin{array}{ccc} \text{I} & \text{II} & \text{III} \end{array} \\ \begin{bmatrix} 80 & 70 & 65 \end{bmatrix} \end{array}$ and $Y = \begin{array}{c} \begin{array}{ccc} \text{I} & \text{II} & \text{III} \end{array} \\ \begin{bmatrix} 85 & 65 & 72 \end{bmatrix} \end{array}$

Now, required matrix = X + Y = [80 70 65] + [80 65 72]

= [165 135 137]

49. **(d)** $\begin{array}{c} \begin{array}{ccc} \text{I} & \text{II} & \text{III} \end{array} \\ \begin{bmatrix} 130 & 130 & 170 \end{bmatrix} \end{array}$

Explanation: Required matrix = [80 75 90] + [50 55 80]

= [130 130 137]

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50. **(d)** $\begin{bmatrix} 165 & 135 & 137 \\ 130 & 130 & 170 \end{bmatrix}$

Explanation: Clearly, R = P + Q

$$= \begin{bmatrix} 80 & 80 \\ 70 & 75 \\ 65 & 90 \end{bmatrix} + \begin{bmatrix} 85 & 50 \\ 65 & 55 \\ 72 & 80 \end{bmatrix} = \begin{bmatrix} 165 & 130 \\ 135 & 130 \\ 137 & 170 \end{bmatrix}$$

$\therefore$ R' = $\begin{bmatrix} 165 & 135 & 137 \\ 130 & 130 & 170 \end{bmatrix}$

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