

OJEE MATHEMATICS SOLUTION 2011

HELD ON 08.05.11

This writeup aims to help you to assess your score in the Orissa JEE-2011. The qns stated have been collected from memory of iBooks Institute® students who appeared at the Exam on 08.05.11. Though we have tried to be accurate, there may be errors (in Qns as well as Answers) in whatever has been stated here. iBooks Institute® is not responsible for the same.

1. $\int e^x \sin(e^x) dx = -\cos(e^x) + c$ (a) $\cos(e^x) + c$ (b) $-\cos(e^x) + c$ (c) $\sin(e^x) + c$ (d) $-\sin(e^x) + c$ **Ans.** $\cos(e^x) + c$
2. $f(x) = \begin{cases} 6x^5 & x \leq 0 \\ 2a+x & x > 0 \end{cases}$ is continuous at $x = 0$ then $a =$ ____ (a) 3 (b) 0 (c) 2 (d) none **Ans.** 0
3. A binary equivalent of $(33)_{10}$ is ____ (a) $(1111)_2$ (b) $(11011)_2$ (c) $(1010110)_2$ (d) None. **Ans.** $(100001)_2$.
4. The mode of the sample 7, 6, 10, 7, 5, 9, 3, 7, 5 is (a) 10 (b) 9 (c) 7 (d) 7.2. **Ans.** 7.
5. If $P(S) = 3$, $P(T) = 4$ (P stands for probability function) S and T are independent events then $P(S/T)$ is (a) 0.12 (b) 0.4 (c) 0.7 (d) 0.3 **Ans.** 0.3 **Reason :** $P(S/T) = P(S) = 3$, as S and T are independent.
6. Let A is a subset of the universal set X . The function $g(x) = \begin{cases} 1, & x \in A \\ 0, & x \notin A \end{cases}$ is ____ (a) one-one (b) into (c) bijective (d) none. **Ans.** onto
7. The number of bijective function form a set having 10 elements to itself is (a) $10!$ (b) $9!$ (c) 2^{10} (d) 2^{100} . **Ans.** $10!$
8. The angle between two lines that have the direction ratio 1, 1, 0 and 2, 1, 2 is (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$ **Ans.** $\frac{\pi}{4}$

Reason: $\theta = \cos^{-1} \left(\frac{a_1 a_2 + b_1 b_2 + c_1 c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2} \sqrt{a_2^2 + b_2^2 + c_2^2}} \right) = \cos^{-1} \left(\frac{2+1+0}{\sqrt{2}\sqrt{9}} \right)$

$$= \cos^{-1} \left(\frac{1}{\sqrt{2}} \right) = \pi/4$$

9. If $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{1}$ is a line lying in the plane $2x-4y+z = 6$ then the value of k is (a) 7 (b) 4 (c) 6 (d) non real value. **Ans.** (d) non real value.

Reason : LET $(4, 2, K) \in 2x-4y+z=6$, $8-8+k=6$, $k=6$,

& $1(2)+1(-4)+1$

$=2-4+1 \neq 0$, so non-real value

10. The radius of the circle $x + 2y + 2z = 15$, $x^2 + y^2 + z^2 - 2y - 4z = 11$ is ____ (a) $\sqrt{7}$ (b) $\sqrt{15}$ (c) 5 (d) $\sqrt{11}$. **Ans.** $\sqrt{7}$
Reason. Centre of the sphere (0, 1, 2). Radius of the sphere = $\sqrt{1+4+11} = 4$. Perpendicular distance of (0, 1, 2) from the plane is $9/3 = 3$. \therefore Radius of circle = $\sqrt{16-9} = \sqrt{7}$

11. The distance between the lines $3x + 4y = 6$ and $6x + 8y = 15$ is ____ (a) $\frac{1}{10}$ (b) $\frac{2}{10}$ (c) $\frac{3}{10}$ (d) $\frac{7}{10}$ **Ans.** $\frac{3}{10}$

Reason: $6x + 8y - 12 = 0$
 $6x + 8y - 15 = 0$

$$\text{Distance} = \frac{|15 - 12|}{\sqrt{6^2 + 8^2}} = \frac{3}{10} \text{ units.}$$

12. The latus rectum of the ellipse $5x^2 + 9y^2 = 45$ is ____ (a) $7/3$ (b) $8/3$ (c) $5/3$ (d) $10/3$ **Ans.** $10/3$ **Reason.** $5x^2 + 9y^2 = 45$, $\frac{x^2}{9} + \frac{y^2}{5} = 1$, $a^2 = 9$, $a = 3$, $b^2 = 5$. Length of L.R = $2b^2/a = 2(5)/3 = 10/3$.
13. The angle between the tangents drawn from the origin to the parabola $y^2 = 4a(x - a)$ is ____ (a) $\pi/2$ (b) $\pi/3$ (c) $\pi/4$ (d) none. **Ans.** $\pi/2$

14. $\vec{a} \cdot (\vec{b} \times \vec{a})$ is equal to ____ (a) 0 (b) 1 (c) -1 (d) 2 **Ans.** 0

Reason: $\vec{a} \cdot (\vec{b} \times \vec{a}) = \vec{b} \cdot (\vec{a} \times \vec{a}) = \vec{b} \cdot \vec{0} = 0$.

15. The area of triangle with vertices (1, 0, 0), (0, 1, 0) and (0, 0, 1) is ____ (a) $1/2$ (b) 1 (c) $\sqrt{3}/2$ (d) 2. **Ans.** $\sqrt{3}/2$ sq.

units **Reason.** A (1, 0, 0), B (0, 1, 0), C (0, 0, 1) $\vec{AB} = -\hat{i} + \hat{j}$, $\vec{AC} = -\hat{i} + \hat{k}$, $\Delta ABC = \frac{1}{2}(\vec{AB} \times \vec{AC}) = \frac{1}{2} \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{vmatrix}$
 $= \frac{1}{2}(\hat{i} + \hat{j} + \hat{k}) = \sqrt{3}/2$ sq. unit.

16. If $|\vec{P}| = |\vec{Q}| = 1$ and $(\vec{P} \times \vec{Q}) \cdot \vec{P} = 1$ then ____ (a) $\vec{P} \parallel \vec{Q}$ (b) $\vec{P} \perp \vec{Q}$ (c) $\vec{P} \cdot \vec{Q} = 1$ (d) none **Ans.** $\vec{P} \perp \vec{Q}$

17. $(3 + \omega + 3\omega^2)^4$ (where ω is the cube root of unity) is equal to ____ (a) 16 (b) 16ω (c) $16\omega^2$ (d) none of these **Ans.** 16ω

Reason: $(3 + \omega + 3\omega^2)^4 = (3(1 + \omega^2) + \omega)^4 = (-3\omega + \omega)^4$
 $= (-2\omega)^4 = 16\omega^4 = 16\omega$.

18. The number of ways in which 7 distinct persons can be distributed among 4 children's (a) 4^7 (b) 7^4 (c) $C(7, 4)$ (d) $P(7, 4)$ **Ans.** $P(7, 4)$

19. A man has 6 friends. The no. of different ways he can invite 2 or more for a dinner is _____. (a) 30 (b) 52 (c) 57 (d) 12. **Ans.** 57.

20. The coefficient of x^{10} in the expression of $(1 + x^2 - x^3)^8$ is ____ (a) 476 (b) 496 (c) 506 (d) 528 **Ans.** 476

Reason: coefficient of x^{10} in $(1 + x^2 - x^3)^8 = (1 + x^2(1-x))^8 = 1 + 8C_1 x^2 (1-x) + 8C_2 x^4 (1-x)^2 + 8C_3 x^6 (1-x)^3 + 8C_4 x^8 (1-x)^4 + 8C_5 x^{10} (1-x)^5 + \dots = {}^8C_4 x^4 C_2 + {}^8C_5 = 70 \times 6 + 8C_5 = 420 + 56 = 476$

21. The value of determinant $\begin{vmatrix} 1 & 0 & 0 \\ 5 & 3 & 2 \\ 2 & 1 & 2 \end{vmatrix}$ is (a) 0 (b) 6 (c) 4 (d) none **Ans.** 4

Reason : $1 \begin{vmatrix} 3 & 2 \\ 1 & 2 \end{vmatrix} = 4$

22. If $P = \begin{pmatrix} \alpha & 0 \\ 1 & 1 \end{pmatrix}$ and $Q = \begin{pmatrix} 1 & 0 \\ 5 & 1 \end{pmatrix}$ such that $P^2 = Q$ then $\alpha =$ ___ (a) -1 (b) 4 (c) 1 (d) none. **Ans.** none

23. Value of $\begin{vmatrix} 0 & 0 & 1 \\ \sin x & \cos x & 0 \\ -\cos x & 1 + \tan x & 0 \end{vmatrix}$. Its minimum value = ____ (a) 0 (b) 1 (c) 2 (d) None. **Ans.** 0

24. The coefficient of the middle term in the expansion of $(1+x)^{2n}$ is ____ (a) C_{n-1}^{2n} (b) $1.3.5 \dots (2n-1)$ (c) $2.6 \dots (4n-2)$ (d) none. **Ans.** $1.3.5 \dots (2n-1)$ **Reason.** $(1+x)^{2n}$. Middle term $T_{n+1} = {}^{2n}C_n (x)^n$. Coefficient = ${}^{2n}C_n = 1.3.5 \dots (2n-1)$

25. If $x + y = 1$, $xy = 2$ then $\tan^{-1} x + \tan^{-1} y$ is equal to ____ (a) $\pi/4$ (b) $\pi/2$ (c) $-\pi/2$ (d) none. **Ans.** None

Reason : $\tan^{-1} x + \tan^{-1} y = \pi + \tan^{-1} \left(\frac{x+y}{1-xy} \right)$

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

$xy = 2 > 1$. $= \pi + \tan^{-1} (-1)$

$= \pi - \pi/4 = 3\pi/4$.

26. The equation $\sin^6 x + \cos^6 x = a^2$ has real solution if ___ (a) $a \in (-1, 1)$ (b) $a \in (-1, 1/2)$ (c) $a \in (-1/2, 1/2)$ (d) none. **Ans.** none

27. If area of a triangle ABC is given by $\Delta a^2 - (b-c)^2$ then $\tan A/2$ is equal to (a) $1/2$ (b) $1/3$ (c) $1/4$ (d) $1/5$. **Ans.** $1/4$

28. The value of $\lim_{x \rightarrow \infty} \ln \cos x$ is ____ (a) 0 (b) 1 (c) not defined (d) -1. **Ans.** not defined.

29. The domain of $f(x) = \frac{1}{\sqrt{|x|-x}}$ is ____ (a) $(0, \infty)$ (b) $(-\infty, \infty)$ (c) $(-\infty, 0)$ (d) $[-1, 1]$ **Ans.** $(-\infty, 0)$

30. The nth derivative $\cos^2 x$ is ____ (a) 0 (b) $2^n \cos \left(\frac{n\pi}{2} + 2x \right)$ (c) $2^{n-1} \cos \left(\frac{n\pi}{2} + 2x \right)$ (d) none. **Ans.** $2^{n-1} \cos \left(\frac{n\pi}{2} + 2x \right)$

31. The value of $\lim_{x \rightarrow \pi/2} (\sec x)^{\pi/2-x}$ is ____ (a) 0 (b) 1 (c) -1 (d) does not exist. **Ans.** 1.

32. The no. of points at which $f(x) = \frac{1}{x-|x|}$ is not continuous is ____ (a) Many points (b) Two points (c) One point (d) None of these. **Ans.** Many points.

33. The point at which point (0, 5) is closest to the curve $x^2 = xy$ is _____. (a) (1, 4) (b) (2, 4) (c) $(\pm 2\sqrt{2}, 4)$ (d) None.
Ans. $(\pm 2\sqrt{2}, 4)$

34. If the slope of the tangent to curve $y = x^3$ at a point is equal to the ordinate of point then point is _____. (a) (27, 3) (b) (3, 27) (c) (1, 2) (d) None. **Ans.** (3, 27).

35. $\lim_{n \rightarrow \infty} \frac{\sqrt{1} + \sqrt{2} + \sqrt{3} + \dots + \sqrt{n}}{n\sqrt{n}} =$ _____. (a) 2/3 (b) 3/2 (c) 3 (d) None. **Ans.** 2/3 **Reason.**

$$\lim_{x \rightarrow \infty} \frac{1^\alpha + 2^\alpha + \dots + x^\alpha}{x^{\alpha+1}} = \frac{1}{\alpha+1} = \frac{1}{\frac{1}{2}+1} = \frac{1}{\frac{3}{2}} = \frac{2}{3}$$

36. In a triangle $\frac{1}{a+c} + \frac{1}{b+c} = \frac{3}{a+b+c}$ then the angle abc in degree _____. (a) 60° (b) 30° (c) 45° (d) None. **Ans.** 60°

Reason: $\frac{1}{a+c} + \frac{1}{b+c} = \frac{3}{a+b+c}$

$$\Rightarrow a^2 + b^2 - c^2 = ab \Rightarrow \cos c = \frac{1}{2} \therefore \angle C = 60^\circ$$

37. $f(x, y, z) = \ln(x^3 + y^3 + z^3 - 3xyz)$ $\frac{\partial f}{\partial x} + \frac{\partial f}{\partial y} + \frac{\partial f}{\partial z} =$ _____. (a) 0 (b) $\frac{1}{x+y+z}$ (c) $\frac{2}{x+y+z}$ (d) none **Ans.** none

Reason : $\frac{\partial v}{\partial x} = \frac{1}{x^3 + y^3 + z^3 - 3xyz} 3(x^2 - yz)$

$$\frac{\partial v}{\partial x} = \frac{\partial v}{\partial y} = \frac{\partial v}{\partial z} = 3 \left[\frac{x^2 + y^2 + z^2 - xy - yz - zx}{x^3 + y^3 + z^3 - 3xyz} \right]$$

$$\frac{3}{x+y+z}$$

38. $f(x) = x^5 - 5x^4 + 5x^3 + 1$ has _____. (a) two maximum and two minimum value (b) two maximum and one minimum value (c) one maximum and one minimum value (d) None **Ans.** one maximum and one minimum value

Reason: $f(x) = x^5 - 5x^4 + 5x^3 + 1$

$$f'(x) = 5x^4 - 20x^3 + 15x^2$$

$$f''(x) = 20x^3 - 60x^2 + 30x$$

$$f'''(x) = 60x^2 - 120x + 30$$

$$f^{iv}(x) = 120x - 120$$

$$f^v(x) = 120 \neq 0$$

$$f'(x) = 0 \Rightarrow 5x^2(x^2 - 4x + 3)$$

$$\Rightarrow 5x^2(x-1)(x-3)$$

$$x = 0, 1, 3$$

$$f''(0) = 0$$

$$f''(1) = -10 \text{ (Max}^m\text{)}$$

$$f''(3) = 540 - 540 + 90 = 90 \text{ (Minimum)}$$

39. If $g(y)$ is inverse of function $f: \mathbb{R} \rightarrow \mathbb{R}$ given by $f(x) = x + 3$ then $g(y) = \underline{\hspace{2cm}}$. (a) $y + 3$ (b) $y - 3$ (c) $y/3$ (d) none.

Ans. $y - 3$. **Reason.** $f(x) = ax + b \Rightarrow f^{-1}(x) = \frac{x-b}{a}$

40. The lines $\frac{x-1}{1} = \frac{y+3}{-3} = \frac{z-6}{6}$ and $\frac{x+1}{-1} = \frac{y-1}{1} = \frac{z-6}{6}$ intersects at (a) $(-1, 2, 6)$ (b) $(-1, 1, 6)$ (c) $(0, 0, 0)$ (d) none

Ans. (c) $(0, 0, 0)$

Reason : $\frac{x-1}{1} = \frac{y+3}{-3} = \frac{z-6}{6} = r_1$, $\frac{x+1}{-1} = \frac{y-1}{1} = \frac{z-6}{6} = r_2$

$$r_1 + 1 = -r_2 - 1 \Rightarrow r_1 + r_2 = -2, \quad 2r_1 = -2$$

$$-3r_1 - 3 = r_2 + 1 \Rightarrow 3r_1 + r_2 = -4, \quad r_1 = -1$$

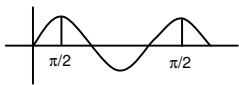
point of intersection is $(0, 0, 0)$.

41. Maximum value of $\sin\left(x + \frac{\pi}{6}\right) + \cos\left(x + \frac{\pi}{6}\right)$ in $(0, \pi/2)$ is (a) $\pi/12$ (b) $\pi/6$ (c) $\pi/3$ (d) $\pi/2$.

Ans. $\pi/12$ **Reason :** $\sin\left(x + \frac{2\pi}{3}\right) + \cos\left(x + \frac{2\pi}{3}\right) = \sqrt{2} \sin\left(x + \frac{2\pi}{3} + \frac{\pi}{4}\right)$ Maximum value achieved

$$= x + 2\pi/3 + \pi/4 = \pi/2 \text{ or } 5\pi/2$$

$$\frac{30\pi - 3\pi - 8\pi}{12} = \frac{19\pi}{12}$$



42. $\int_{-2}^2 |1 - x^2| dx =$ (a) 4 (b) 2 (c) -2 (d) 0 **Ans.** 2

Reason: $\int_{-1}^1 |1 - x^2| dx + \int_1^2 |1 - x^2| dx$

$$= \int_{-1}^1 (1 - x^2) dx + \int_1^2 (x^2 - 1) dx$$

$$= \left[x - \frac{x^3}{3} \right]_{-1}^1 + \left[\frac{x^3}{3} - x \right]_1^2$$

$$= \left(1 - \frac{1}{3}\right) - \left(-1 + \frac{1}{3}\right) + \frac{8}{3} - 2 - \left(\frac{1}{3} - 1\right) = \frac{4}{3} + \frac{2}{3} = 2$$

43. $\int_0^{\pi} \sqrt{\frac{1+\cos 2x}{2}} dx$ is ____ (a) 2 (b) -1 (c) 0 (d) -3. **Ans. 2 Reason:** $\int_0^{\pi} |\cos x| dx = \int_0^{\pi/2} \cos x dx + \int_{\pi/2}^{\pi} -\cos x dx = 1 + 1 = 2.$

44. $\int_0^{\pi/2} \frac{\cos 2x}{\cos x + \tan x} dx =$ ____ (a) -1 (b) 1 (c) 0 (d) 2. **Ans. 0**

Reason: $\int_0^{\pi/2} \frac{\cos^2 x - \sin 2x}{\cos x + \sin x} dx = \int_0^{\pi/2} \frac{(\cos x - \sin x)}{\cos x + \sin x} dx$

$$= [\sin x + \cos x]_0^{\pi/2} = (1+0) - (0+1) = 0.$$

45. If $\int \frac{dx}{5+4\cos x} = p \tan(Q \tan x/2) + c$, then value of P equals to ____ (a) 1/3 (b) 1/6 (c) 2/3 (d) 2/9 **Ans. 2/3**

Reason: $\int \frac{du}{\frac{5+4(1-\tan^2 x/2)}{(1+\tan^2 x/2)}} = \int \frac{\sec^2 \frac{x}{2} dx}{9 + \tan^2 \frac{x}{2}}$

$$= 2 \cdot \int \frac{dt}{9+t^2} = 2 \cdot \frac{1}{3} \tan^{-1} \left(\frac{t}{3}\right) + c$$

$$= \frac{2}{3} \left(\frac{\tan x/2}{3}\right) + c$$

46. $\int \sin^{-1} x dx$ is ____ (a) $x \cos^{-1} x - \sqrt{1-x^2} + C$ (b) $x \sin^{-1} x + \sqrt{1-x^2} + C$ (c) $x \sin^{-1} x - \sqrt{1-x^2} + C$ (d) None. **Ans. x sin⁻¹ x + √(1-x²) + C Reason.** $\int t \cos t dt = t \sin t + \cos t + C = \sin^{-1} x \cdot x + \sqrt{1-x^2} + C$ ($\sin^{-1} x = t, x = \sin t, dx = \cos t dt$)

47. Angle at which circle $x^2 + y^2 = 16$ can be seen from pt. (8, 0) is **Ans. π/3.**

48. Differentiable function f defined for all $x > 0$ and satisfies $f(x^3) = x^4$ for all $x > 0$ $f'(27)$ (f' denotes the derivative) is equal to ____ (a) 4 (b) 27 (c) 81 (d) none. **Ans. 4 Reason.** $f'(x^3) \cdot 3x^2 = 4x^3, f'(x^3) = 4/3 x, f'(27) = 4/3 \cdot 3 = 4.$

49. Solution of differential equation $\frac{dx}{dy} = \frac{e^y - e^{-y}}{e^y + e^{-y}}$ is _____. (a) $x = \ln(e^y - e^{-y}) + c$ (b) $x = \ln(e^y + e^{-y}) + c$ (c) $y = \ln$

$$(e^x - e^{-x}) + c \text{ (d) None. } \mathbf{Ans. } x = \ln(e^y + e^{-y}) + c \mathbf{Reason: } dx = \frac{e^y - e^{-y}}{e^y + e^{-y}} dy$$

$$\Rightarrow x = \ln |e^y + e^{-y}| + c$$

50. Equation $x^2/2-r + y^2/r-5 + 3 = 0$ represent on ellipse if (a) $r > 2$ (b) $r > 5$ (c) $2 < r < 5$ (d) none. **Ans. 2 < r < 5 Ans.**

$$\frac{x^2}{2-r} + \frac{y^2}{r-5} = -3 \Rightarrow 2-r < 0, r-5 < 0 = 2 < r < 5$$

51. For any $a \in \mathbb{R}$ the locus $x^2 + y^2 - 2ax - 2ay + a^2 = 0$ touches the line (a) $x = y$ (b) $x = 0$ (c) none (d) $x + y = 0$. **Ans. x = 0 Reason.** The circle touches to both the axes.

52. If $x + y + z = 0$, $4x + 3y - z = 0$ and $3x + 5y + 3z = 0$ is a system of equation then which of following is correct (a) It is inconsistent (b) It has only single solution $x = 0, y = 0, z = 0$ (c) Determinant of coefficient of matrix is zero (d) It is infinitely many solution. **Ans.** It has only single solution $x = 0, y = 0, z = 0$
53. If $\left(\frac{3}{2} + i\frac{\sqrt{3}}{2}\right)^{50} = 3^{25}(x - iy)$ (where x, y are real and $i = \sqrt{-1}$) then the order pair (x, y) is given by (a) $(0, 3)$ (b) $(1/2, \sqrt{3})$ (c) $(-3, 0)$ (d) none **Ans.** none
- Reason : $(\sqrt{3})^{50} \left(\frac{\sqrt{3}}{2} + i\frac{1}{2}\right)^{50} = 3^{25} \left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)^{50}$
- $$= 3^{25} \left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right) = 3^{25} \left(\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)$$
- $$x = \frac{1}{2}, y = \frac{\sqrt{3}}{2}$$
54. 25 people for programme A, 50 people for programme, 10 people for both. So no of employee employed only A is _____ (a) 15 (b) 20 (c) 35 (d) none. **Ans.** 15 **Reason.** $|A - B| = |A| - |A \cap B| = 25 - 10 = 15$.
55. If it is raining then I will not come, give its contrapositive. (a) If I will come, then it is not raining (b) If I will not come, then it is raining (c) If I will not come, then it is not raining (d) If I will come, then it is raining. **Ans.** If I will come, then it is not raining
56. $f(x) = \begin{cases} x^P \sin 1/x & 1x > 0 \\ 0 & x = 0 \end{cases}$ is continuous at $x = 0$ but not in the internal differentiable then plies (a) $P > 1$ (b) $P \in (0, 1)$ (c) $P < 0$ (d) none **Ans.** $P \in (0, 1)$ **Reason.** Continuous but not differentiable if $P \in (0, 1)$.
57. Two dice is rolled one black and one white the probability that sum of two no. is 7 and no. of black is greater than the no. of white (a) $\frac{1}{12}$ (b) $\frac{1}{6}$ (c) $\frac{1}{4}$ (d) none. **Ans.** $\frac{1}{12}$.
58. Which relation is the function ? (a) $(x, \sin^{-1}x)$ (b) $(x, \tan x)$ (c) $x, y > x, x, y \in \mathbb{R}$ (d) None. **Ans.** $(x, \sin^{-1}x)$ **Reason:** Since it is one-one relation.
59. If $3\vec{P} + 2\vec{R} - 5\vec{Q} = \vec{0}$. Then (a) P, Q, R are collinear (b) P, Q, R vertices of a Δ (c) Q divides PR externally (d) None
60. If equation. $\tan \theta + \tan 2\theta + \tan \theta \tan 2\theta = 1$, $\theta =$ **Ans.** $\frac{n\pi}{3} + \frac{\pi}{12}$