CHENGALPATTU - 603002

COMMON QUARTERLY EXAMINATION - 2024

Standard XII Reg.No. [ ]

MATHEMATICS

Time : 3.00 hrs **Part - I** *Marks : 90*

I. Choose the correct answer: 20 x 1 = 20

1. If $A=\begin{bmatrix}7 & 3\\ 4 & 2\end{bmatrix}$, then $9I_2-A=$

   a) A^{-1} b) $\frac{A^{-1}}{2}$ c) $3A^{-1}$ d) $2A^{-1}$

2. If A is non-singular matrix such that $A^{-1}=\begin{bmatrix}5 & 3\\ -2 & -1\end{bmatrix}$, then $(A^T)^{-1}=$

   a) $\begin{bmatrix}-5 & 3\\ 2 & 1\end{bmatrix}$ b) $\begin{bmatrix}5 & 3\\ -2 & -1\end{bmatrix}$ c) $\begin{bmatrix}-1 & -3\\ 2 & 5\end{bmatrix}$ d) $\begin{bmatrix}5 & -2\\ 3 & -1\end{bmatrix}$

3. If $(AB)^{-1}=\begin{bmatrix}12 & -17\\ -19 & 27\end{bmatrix}$ and $A^{-1}=\begin{bmatrix}1 & -1\\ -2 & 3\end{bmatrix}$, then $B^{-1}=$

   a) $\begin{bmatrix}2 & -5\\ -3 & 8\end{bmatrix}$ b) $\begin{bmatrix}8 & 5\\ 3 & 2\end{bmatrix}$ c) $\begin{bmatrix}3 & 1\\ 2 & 1\end{bmatrix}$ d) $\begin{bmatrix}8 & -5\\ -3 & 2\end{bmatrix}$

4. If $A=\begin{bmatrix}2 & 3\\ 5 & -2\end{bmatrix}$ be such that $\lambda A^{-1}=A$, then λ is

   a) 17 b) 14 c) 19 d) 21

5. The area of the triangle formed by the complex numbers z, iz and z+iz in the Argand's diagram is

   a) $\frac{1}{2}|z|^2$ b) $|z|^2$ c) $\frac{3}{2}|z|^2$ d) $2|z|^2$

6. If |z| = 1, then the value of $\frac{1+z}{1+\bar{z}}$ is

   a) z b) $\bar{z}$ c) $\frac{1}{z}$ d) 1

7. The principal argument of $(\sin 40^\circ + i\cos 40^\circ)^5$ is

   a) -110° b) -70° c) 70° d) 110°

8. Choose the wrong statement.

   a) $|z|^2=1 \Rightarrow \frac{1}{z}=\bar{z}$ b) $\text{Re}(z)\le|z|$

   c) $||z_1|-|z_2||\ge|z_1+z_2|$ d) $|z^n|=|z|^n$

9. If α, β and γ are the zeros of x^3+px^2+qx+r, then $\Sigma\frac{1}{\alpha}$ is

   a) $\frac{-q}{r}$ b) $\frac{-p}{r}$ c) $\frac{q}{r}$ d) $\frac{-q}{p}$

10. The number of positive zeros of the polynomial $\sum_{r=0}^{n} nC_r(-1)^r x^r$

a) 0 b) n c) < n d) r

11. The period of y = cos6x + sin4x is

a) π b) $\frac{5\pi}{6}$ c) 3π d) 4π.

12. The value of $\sin^{-1}(\cos x)$, $0 \le x \le \pi$ is

a) $\pi - x$ b) $x - \frac{\pi}{2}$ c) $\frac{\pi}{2} - x$ d) $x - \pi$

13. $\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{2}{9}\right)$ is equal to

a) $\frac{1}{2}\cos^{-1}\left(\frac{3}{5}\right)$ b) $\frac{1}{2}\sin^{-1}\left(\frac{3}{5}\right)$ c) $\frac{1}{2}\tan^{-1}\left(\frac{3}{5}\right)$ d) $\tan^{-1}\left(\frac{1}{2}\right)$

14. if $\sin^{-1}\frac{x}{5} + \operatorname{cosec}^{-1}\left(\frac{5}{4}\right) = \frac{\pi}{2}$, then the value of x is

a) 4 b) 5 c) 2 d) 3

15. The radius of the circle $3x^2 + by^2 + 4bx - 6by + b^2 = 0$ is

a) 1 b) 3 c) $\sqrt{10}$ d) $\sqrt{11}$

16. An ellipse has OB as semi minor axes, F and F′ its foci and the angle FBF′ is a right angle. Then the eccentricity of the ellipse is

a) $\frac{1}{\sqrt{2}}$ b) $\frac{1}{2}$ c) $\frac{1}{4}$ d) $\frac{1}{\sqrt{3}}$

17. The locus of a point whose distance from (–2,0) is $\frac{2}{3}$ times its distance from the line $x = \frac{-9}{2}$ is

a) a parabola b) a hyperbola c) an ellipse d) a circle

18. If a vector $\bar{\alpha}$ lies in the plane of $\bar{\beta}$ and $\bar{\gamma}$, then

a) $[\bar{\alpha}, \bar{\beta}, \bar{\gamma}] = 1$ b) $[\bar{\alpha}, \bar{\beta}, \bar{\gamma}] = -1$ c) $[\bar{\alpha}, \bar{\beta}, \bar{\gamma}] = 0$ d) $[\bar{\alpha}, \bar{\beta}, \bar{\gamma}] = 2$

19. If $\vec{a} \times (\vec{b} \times \vec{c}) = (\vec{a} \times \vec{b}) \times \vec{c}$, where $\vec{a}, \vec{b}, \vec{c}$ are any three vectors such that $\vec{b} \cdot \vec{c} \neq 0$ and $\vec{a} \cdot \vec{b} \neq 0$, then $\vec{a}$ and $\vec{c}$ are

a) perpendicular b) parallel

c) inclined at an angle $\frac{\pi}{3}$ d) inclined at an angle $\frac{\pi}{6}$

20. Distance from the origin to the plane 3x – 6y + 2z + 7 = 0 is

a) 0 b) 1 c) 2 d) 3

Part - II

II. Answer any 7 questions. (Q.No.30 is compulsory) **7 x 2 = 14**

21. Find the rank by minor method : $\begin{bmatrix} -1 & 3 \\ 4 & -7 \\ 3 & -4 \end{bmatrix}$

22. Prove that $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ is orthogonal.

23. Write in rectangular form : $\overline{(5+9i)+(2-4i)}$

24. Show that $|z-2-i| = 3$ represent a circle and find its centre and radius.

25. If α and β are the roots of the quadratic equation $17x^2 + 43x - 73 = 0$, construct a quadratic equation whose roots are $\alpha + 2$ and $\beta + 2$

26. Find a polynomial equation of minimum degree with rational coefficients having 2i+3 as a root.

27. Find all the values of x such that $-10\pi \leq x \leq 10\pi$ and $\sin x = 0$

28. Find the general equation of the circle whose diameter is the line segment joining the points (–4,–2) and (1,1)

29. If $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} + \hat{j} - 2\hat{k}$, $\vec{c} = 3\hat{i} + 2\hat{j} + \hat{k}$, find $\vec{a} \cdot (\vec{b} \times \vec{c})$

30. Prove that $\sum_{n=1}^{204} \left(i^{n+1} + i^{n+2}\right) = 0$

Part - III

III. Answer any 7 questions. (Q.No.40 is compulsory) **7 x 3 = 21**

31. Solve by matrix inversion method : $2x - y = 8$, $3x + 2y = -2$

32. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 3 & 0 & 5 \end{bmatrix}$ by reducing it to a row-echelon form.

33. If $|z| = 3$, show that $7 \leq |z + 6 - 8i| \leq 13$

34. If $\omega \neq 1$ is a cube root of unity, show that $(1 + \omega + \omega^2)^6 + (1 + \omega - \omega^2)^6 = 128$

35. Solve : $x^3 - 3x^2 - 33x + 35 = 0$

36. Find the exact number of real and imaginary zeros of the polynomial $x^9 + 9x^7 + 7x^5 + 5x^3 + 3x$

37. Find the value of $\tan^{-1}(-1) + \cos^{-1}\left(\frac{1}{2}\right) + \sin^{-1}\left(\frac{-1}{2}\right)$

38. Prove that $\cos^{-1}(\cos 10) = 4\pi - 10$

39. A particle acted on by constant forces $8\hat{i} + 2\hat{j} - 6\hat{k}$ and $6\hat{i} + 2\hat{j} - 2\hat{k}$ is displaced from the point (1,2,3) to the point (5,4,1), prove that work done by forces is 80 units.

40. Find the equations of the tangent and normal to the circle $x^2 + y^2 = 25$ at P(–3,4)

Part - IV

IV. Answer all the questions. **7 x 5 = 35**

41. a) If $F(\alpha)=\begin{vmatrix}\cos\alpha & 0 & \sin\alpha\\ 0 & 1 & 0\\ -\sin\alpha & 0 & \cos\alpha\end{vmatrix}$, show that $[F(\alpha)]^{-1}=F(-\alpha)$ ***(OR)***

b) If $2+i$ and $3-\sqrt{2}$ are roots of the equation $x^6-13x^5+62x^4-126x^3+65x^2+127x-140=0$. Find all roots.

42. a) If z_1, z_2 and z_3 are three complex numbers such that $|z_1|=1$, $|z_2|=2$, $|z_3|=3$ and $|z_1+z_2+z_3|=1$. Show that $|9z_1z_2+4z_1z_3+z_2z_3|=6$ ***(OR)***

b) Find the domain of f(x) =

$$f(x)=\sin^{-1}\left(\frac{|x|-2}{3}\right)+\cos^{-1}\left(\frac{1-|x|}{4}\right)$$

43. a) If $z=x+iy$ is a complex number such that $\text{Im}\left(\frac{2z+1}{iz+1}\right)=0$. Show that the locus of z is $2x^2+2y^2+x-2y=0$

(OR)

b) If the equations $x^2+px+q=0$ and $x^2+p'x+q'=0$ have a common root, show that it must be equal to $\frac{pq'-p'q}{q-q'}$ or $\frac{q-q'}{p'-p}$

44. a) Find the vertex, focus, directrix and length of latus rectum of the parabola $x^2-4x-5y-1=0$ ***(OR)***

b) Prove by vector method : $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$.

45. a) Investigate the values of λ and μ the system of linear equation $2x+3y+5z=9$, $7x+3y-5z=8$, $2x+3y+\lambda z=\mu$, have (i) no solution (ii) a unique solution (iii) an infinite number of solutions. ***(OR)***

b) Find the non-parametric form of vector equation and cartesian equation of the plane passing through the point (2,3,6) and parallel to the straight line

$$\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-3}{1} \text{ and } \frac{x+3}{2}=\frac{y-3}{-5}=\frac{z+1}{-3}$$

46. a) Evaluate : $\sin\left[\sin^{-1}\left(\frac{3}{5}\right)+\sec^{-1}\left(\frac{5}{4}\right)\right]$ ***(OR)***

b) Solve by Cramer's rule : $3x+3y-z=11$, $2x-y+2z=9$, $4x+3y+2z=25$

47. a) A bridge has a parabolic arch that is 10 m high in the centre and 30 m wide at the bottom. Find the height of the arch 6 m from the centre on either sides. ***(OR)***

b) If $2\cos\alpha=x+\frac{1}{x}$ and $2\cos\beta=y+\frac{1}{y}$, show that,

i) $xy-\frac{1}{xy}=2i\sin(\alpha+\beta)$ ii) $x^my^n+\frac{1}{x^my^n}=2\cos(m\alpha+n\beta)$

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23.09.24

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COMMON QUARTERLY EXAMINATION - 2024

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STD - 12 MATHEMATICS - KEY MARKS: 90

PART - I

1	d	$2A^{-1}$
2	d	$\begin{bmatrix}5 & -2\\3 & -1\end{bmatrix}$
3	a	$\begin{bmatrix}2 & -5\\-3 & 8\end{bmatrix}$
4	c	19
5	a	$\frac{1}{2}\lvert z\rvert^2$
6	a	z
7	a	-110°
8	c	$\lvert\lvert z_1\rvert-\lvert z_2\rvert\rvert \le \lvert z_1+z_2\rvert$
9	a	$-q/r$
10	b	n
11	b	$5\pi/6$
12	c	$\pi/2 - x$
13	d	$\tan^{-1}(1/2)$
14	d	3
15	c	$\sqrt{10}$
16	a	$1/\sqrt{2}$
17	c	an ellipse
18	c	$[\vec{\alpha},\vec{\beta},\vec{\gamma}]=0$
19	b	parallel
20	b	1

II PART - II

21. $\begin{vmatrix}-1 & 3\\4 & -7\end{vmatrix} = -5 \neq 0 \quad \rho(A)=2$

22. $AA^T = \begin{bmatrix}\cos\theta & -\sin\theta\\ \sin\theta & \cos\theta\end{bmatrix}\begin{bmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{bmatrix} = \begin{bmatrix}1 & 0\\0 & 1\end{bmatrix} = I$

$AA^T = A^TA = I$

23. $\overline{(5+9i)} + \overline{(2-4i)} = 5-9i+2+4i = 7-5i$

24. $\lvert z-(2+i)\rvert = 3$, centre $=(2,1)$, radius $=3$

25. $\alpha+\beta = \frac{-43}{17}$, $\alpha\beta = -73/17$

sum of the roots $= \alpha+\beta+4 = 25/17$

Product of the roots $= \alpha\beta+2(\alpha+\beta)+4 = \frac{-91}{17}$

$17x^2-25x-91=0$

26. Sum = 6, Product = 13

$x^2-6x+13=0$

27. $\sin x = 0 \Rightarrow x = n\pi,\ n\in Z$

$x = n\pi,\ n\in[-10,10]$

28. $(x+4)(x-1)+(y+2)(y-1)=0$

$\Rightarrow x^2+y^2+3x+y-6=0$

29. $\vec{a}\cdot(\vec{b}\times\vec{c}) = \begin{vmatrix}1 & -2 & 3\\2 & 1 & -2\\3 & 2 & 1\end{vmatrix} = 24$

30. $=(i^2+i^3)+(i^3+i^4)+(i^4+i^5)+\dots+i^{205}+i^{206}$

$= -1-i-i+1+1+i+\dots+i-1$

$=0$

PART - III

31. $\lvert A\rvert = 7 \quad A^{-1} = \frac{1}{7}\begin{bmatrix}2 & 1\\-3 & 2\end{bmatrix}$

$X = A^{-1}B \Rightarrow X = \frac{1}{7}\begin{bmatrix}2 & 1\\-3 & 2\end{bmatrix}\begin{bmatrix}8\\-2\end{bmatrix} \Rightarrow x=2, y=-4$

32. $\xrightarrow[R_3\to R_3-3R_1]{R_2\to R_2-2R_1}\begin{bmatrix}1 & 2 & 3\\0 & -3 & -2\\0 & -6 & -4\end{bmatrix}\xrightarrow{R_3\to R_3-2R_2}\begin{bmatrix}1 & 2 & 3\\0 & -3 & -2\\0 & 0 & 0\end{bmatrix}$

$\rho(A)=2$

33. $\lvert\lvert z\rvert-\lvert 6-8i\rvert\rvert \le \lvert z+6-8i\rvert \le \lvert z\rvert+\lvert 6-8i\rvert$

$\lvert 3-10\rvert \le \lvert z+6-8i\rvert \le 3+\sqrt{36+64}$

$\lvert -7\rvert \le \lvert z+6-8i\rvert \le 3+10$

$7 \le \lvert z+6-8i\rvert \le 13$

34. LHS $= (-\omega-\omega)^6+(-\omega^2-\omega^2)^6 = (2\omega)^6+(2\omega^2)^6$

$= 2^6(\omega^6+\omega^{12}) = 2^6\times 2 = 128$

36. The number of changes in sign is 0 in $f(x)$

The number of changes in sign is 0 in $f(-x)$

Thus it has no real zero

$x=0$ is a zero

Thus it has 8 imaginary zeros.

37. $=\tan^{-1}(-1)+\cos^{-1}(1/2)+\sin^{-1}(-1/2)$

$= -\pi/4+\pi/3-\pi/6 = -\pi/12$

35.
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1 | 1   -3   -33   35
  | 0    1    -2  -35
  ---------------------
    1   -2   -35 | 0
```

$x^2-2x-35=0$

$(x-1)(x^2-2x-35)=0$

$(x-1)(x-7)(x+5)=0 \Rightarrow x=1,7,-5$

38. $\cos^{-1}(\cos 10) = t$

$\cos 10 = \cos t$

$\cos 10 = \cos(4\pi - t)$

$t = 4\pi - 10$

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39. $\vec{F} = 14\hat{i}+4\hat{j}-8\hat{k}$, $\vec{d} = 4\hat{i}+2\hat{j}-2\hat{k}$

$W = \vec{F}\cdot\vec{d} = 56+8+16 = 80$

40. $xx_1 + yy_1 = a^2$

$x(-3)+y(4)=25 \Rightarrow -3x+4y=25 \rightarrow$ tangent

$xy_1 - yx_1 = 0 \Rightarrow 4x+3y=0 \rightarrow$ Normal

PART - IV

41 a. $|F(\alpha)| = 1 \neq 0$ $[F(\alpha)]^{-1}$ exists

$\text{adj } F(\alpha) = \begin{bmatrix} \cos\alpha & 0 & -\sin\alpha \\ 0 & 1 & 0 \\ \sin\alpha & 0 & \cos\alpha \end{bmatrix}$

$[F(\alpha)]^{-1} = \frac{1}{1}\begin{bmatrix} \cos\alpha & 0 & -\sin\alpha \\ 0 & 1 & 0 \\ \sin\alpha & 0 & \cos\alpha \end{bmatrix} = F(-\alpha)$

b. $2+i$ root also $2-i$ root

$3-\sqrt{2}$ are roots, $3+\sqrt{2}$ are also roots

$(x-(2+i)),(x-(2-i)),(x-(3-\sqrt{2}))(x-(3+\sqrt{2}))$

Product $= (x^2-4x+5)(x^2-6x+7)$

other factor (x^2-3x-4)

roots : $2+i, 2-i, 3+\sqrt{2}, 3-\sqrt{2}, -1$ and 4

42 a. $|z_1| = 1 \Rightarrow |z_1|^2 = 1 \Rightarrow z\bar{z}_1 = 1 \Rightarrow z_1 = \frac{1}{\bar{z}_1}$

$|z_2| = 2 \Rightarrow |z_2|^2 = 4 \Rightarrow z_2 = \frac{4}{\bar{z}_2}$

$|z_3| = 3 \Rightarrow |z_3|^2 = 9 \Rightarrow z_3 = \frac{9}{\bar{z}_3}$

$= \left|(z_1z_2z_3)\left(\frac{9}{z_3}+\frac{4}{z_2}+\frac{1}{z_1}\right)\right|$

$= |z_1||z_2||z_3||\bar{z}_3+\bar{z}_2+\bar{z}_1|$

$= |z_1||z_2||z_3||z_1+z_2+z_3|$

$= 1\times2\times3\times1$

$= 6$

b. domain of $\sin^{-1}x$ and $\cos^{-1}x$ is $[-1,1]$

$-1 \le \frac{|x|-2}{3} \le 1$ | $-1 \le \frac{1-|x|}{4} \le 1$

$-3 \le |x|-2 \le 3$ | $-4 \le 1-|x| \le 4$

$-1 \le |x| \le 5$ | $-5 \le -|x| \le 3$

$|x| \le 5$ — (1) | $-3 \le |x| \le 5$ (2)

$-5 \le x \le 5$

43 a. $\frac{2z+1}{iz+1} = \frac{2(x+iy)+1}{i(x+iy)+1} = \frac{(2x+1)+i2y}{(1-y)+ix} \times \frac{(1-y)-ix}{1-y-ix}$

$\text{Im}\left(\frac{2z+1}{iz+1}\right) = 0 \Rightarrow \frac{-x(2x+1)+2y(1-y)}{(1-y)^2+x^2} = 0$

$-2x^2-x+2y-2y^2=0$

$2x^2+2y^2+x-2y=0$

b. $x^2+px+q=0$, $x^2+p'x+q'=0$

$\alpha^2+p\alpha+q=0$ — (1) $\alpha^2+p'\alpha+q'=0$ — (2)

(1) & (2) cross multiplication method.

$\frac{\alpha^2}{pq'-p'q} = \frac{\alpha}{q-q'} = \frac{1}{p'-p}$

$\alpha^2 = \frac{pq'-p'q}{p'-p}$

$\alpha = \frac{q-q'}{p'-p}$ or $\alpha = \frac{\alpha^2}{\alpha} = \frac{\frac{pq'-p'q}{p'-p}}{\frac{q-q'}{p'-p}} = \frac{pq'-p'q}{q-q'}$

44 a. $x^2-4x = 5y+1$

$x^2-4x+4 = 5y+1+4$

$(x-2)^2 = 5(y+1) \Rightarrow 4a = 5$

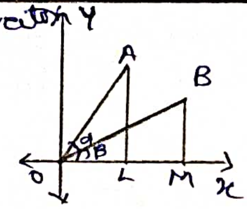
Vertex : $(2,-1)$

Focus : $(2, 1/4)$

directrix: $4y+9$

L. of Latus rectum : 5 units

b. $\hat{a} = \vec{OA}$, $\hat{b} = \vec{OB}$ be the unit vectors



$\hat{a} = \cos\alpha\hat{i}+\sin\alpha\hat{j}$

$\hat{b} = \cos\beta\hat{i}+\sin\beta\hat{j}$

angle between $\hat{a}$ and $\hat{b}$ is $(\alpha-\beta)$

$\hat{a}\cdot\hat{b} = |\hat{a}||\hat{b}|\cos(\alpha-\beta) = \cos(\alpha-\beta)$

$\hat{a}\cdot\hat{b} = (\cos\alpha\hat{i}+\sin\alpha\hat{j})(\cos\beta\hat{i}+\sin\beta\hat{j})$

$\cos(\alpha-\beta) = \cos\alpha\cos\beta+\sin\alpha\sin\beta$

45 a. $[A, B] = \begin{bmatrix} 2 & 3 & 5 & 9 \\ 7 & 3 & -5 & 8 \\ 2 & 3 & \lambda & \mu \end{bmatrix}$

$\sim \begin{bmatrix} 2 & 3 & 5 & 9 \\ 0 & -15 & -45 & -47 \\ 0 & 0 & \lambda-5 & \mu-9 \end{bmatrix}$ $2R_2-7R_1$, R_3-R_2

(i) No solution : $\lambda=5, \mu\neq9$

$P(A) = 2$, $P(A|B) = 3$

(ii) unique solution : $\lambda\neq5$, $\mu\in R$

$P(A) = P(A|B) = 3$

(iii) Infinite solutions : $\lambda=5$, $\mu=9$

$P(A) = P(A|B) = 2$

45. b.

$\vec{a} = 2\hat{i}+3\hat{j}+6\hat{k}$

$\vec{u} = 2\hat{i}+3\hat{j}+\hat{k}$

$\vec{v} = 2\hat{i}-5\hat{j}-3\hat{k}$

$\vec{u}\times\vec{v} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & 1 \\ 2 & -5 & -3 \end{vmatrix} = -4\hat{i}+8\hat{j}-16\hat{k}$

$(\vec{r}-\vec{a})\cdot(\vec{u}\times\vec{v}) = 0$

$[\vec{r}-(2\hat{i}+3\hat{j}+6\hat{k})][-4\hat{i}+8\hat{j}-16\hat{k}] = 0$

$\vec{r}\,(-4\hat{i}+8\hat{j}-16\hat{k})+80$

$\vec{r}\,(\hat{i}-2\hat{j}+4\hat{k}) = 20$

$x-2y+4z = 20$

46. a.

$\sec^{-1}\frac{5}{4} = \theta$, $\sec\theta = 5/4$, $\cos\theta = 4/5$

$\sin\theta = \sqrt{1-\cos^2\theta} = 3/5$. $\theta = \sin^{-1}(3/5)$

$\sec^{-1}(5/4) = \sin^{-1}(3/5)$

$\Rightarrow \sin^{-1}(3/5)+\sec^{-1}(5/4) = 2\sin^{-1}(3/5)$

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

$= \sin^{-1}(24/25)$

$\sin[\sin^{-1}(3/5)+\sec^{-1}(5/4)] = \sin[\sin^{-1}(24/25)]$

$= 24/25$

b.

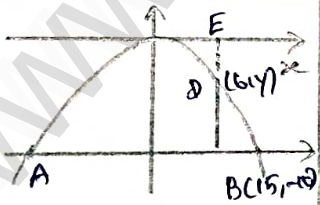
$\Delta = -22$, $\Delta x = -44$, $\Delta y = -66$

$\Delta z = -88$

$x = \frac{\Delta x}{\Delta} = 2$, $y = \frac{\Delta y}{\Delta} = 3$, $z = \frac{\Delta z}{\Delta} = 4$

47. a.

$x^2 = -4ay$



$B(15,-10) \Rightarrow$

$15^2 = -4a(-10)$

$\frac{225}{10} = 4a$

$x^2 = -\frac{225}{10}y$, $DE = y$

$D(6,y) \Rightarrow 36 = \frac{-225}{10}y$

$y = \frac{-360}{225} = -1.6$

$DE = 1.6$ m

$CD = 10-1.6 = 8.4$ m

b.

$x = \cos\alpha + i\sin\alpha$

$y = \cos\beta + i\sin\beta$

(i)

$xy = \cos(\alpha+\beta)+i\sin(\alpha+\beta)$

$\frac{1}{xy} = \cos(\alpha+\beta) - i\sin(\alpha+\beta)$

$\boxed{xy - 1/xy = 2i\sin(\alpha+\beta)}$

(ii)

$x^m y^n = \cos(m\alpha+n\beta)+i\sin(m\alpha+n\beta)$

$\frac{1}{x^m y^n} = \cos(m\alpha+n\beta) - i\sin(m\alpha+n\beta)$

$\boxed{x^m y^n + \frac{1}{x^m y^m} = 2\cos(m\alpha+n\beta)}$

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