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$\pi_1 \cdot \pi_2$

$Q = \cos^{-1}(\pi_1 \pi_2)$

$\begin{bmatrix} 5 \\ 13 \\ -7 \end{bmatrix} \cdot \begin{bmatrix} 8 \\ 25 \\ -7 \end{bmatrix}$

$= 40 + 325 + 49 = 414$

$|n_1| = \sqrt{(5)^2 + (13)^2 + (-7)^2} = 9\sqrt{3}$

$|n_2| \sqrt{8^2 + 25^2 + (-7)^2} = 3\sqrt{82}$

$\cos^{-1}\left(\frac{414}{9\sqrt{3} \times 3\sqrt{82}}\right)$

$= \boxed{Q = 12.15^\circ}$

Q3

a) find value of t

$l_1 = ti + j \quad \& \quad -2j \quad -j$

$l_2 = j + tk \quad \& \quad -2j \quad +k$

Shortest d between d_1 & d_2 is $\sqrt{21}$

$r_1 = \overrightarrow{OA} + \lambda \overrightarrow{AB}$

$r_2 = \overrightarrow{OA} + \mu \overrightarrow{AB}$

$r_1 = \begin{bmatrix} t \\ 1 \\ 0 \end{bmatrix} + \lambda \begin{bmatrix} -2 \\ -1 \\ 0 \end{bmatrix} \qquad r_2 = \begin{bmatrix} 0 \\ 1 \\ t \end{bmatrix} + \mu \begin{bmatrix} 0 \\ -2 \\ 1 \end{bmatrix}$

Normal vector

$D = \frac{(b_1 \times b_2) \cdot (a_2 - a_1)}{|b_1 \times b_2|}$

$(b_1 \times b_2) = \begin{vmatrix} i & j & k \\ -2 & -1 & 0 \\ 0 & -2 & 1 \end{vmatrix} = -\hat{i} + 2\hat{j} + 4\hat{k}$

$= \sqrt{(-1)^2 + (2)^2 + (4)^2}$

$= \sqrt{21}$

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$$(a_2 - a_1) = \begin{bmatrix} 0 \\ 1 \\ t \end{bmatrix} - \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$$

$$= -t i + t\hat{k}$$

$$D = \frac{(-i + 2j + 4\hat{k}) \cdot (-t i + t\hat{k})}{\sqrt{21}}$$

$$(\sqrt{21})(\sqrt{21}) = (-i + 2j + 4k) \cdot (-ti + tk)$$

$$21 = 5t + 4 \cancel{\sqrt{21}}$$

$$\frac{21}{5} = \frac{5t}{5}$$

$$\boxed{\frac{21}{5} = t}$$

(b) $\vec{r_1} = \frac{21}{5} i + j + \lambda(2\hat{i} - j)$

$$\vec{r_2} = j - \frac{21}{5}\hat{k} + u(-2j + \hat{k})$$

$$\pi_1 = r = \vec{OA} + \lambda \vec{AB} + u\vec{AC}$$

$$\boxed{r = -\frac{21}{5} i + j + \lambda(-2i - j) + u(-2j + k)}$$

(c) from L_2 & π_2 find Acute Angle.

$$\lambda_2 = 5x - 6y + 5z = 0$$

$$\lambda_2 = \frac{x - 0}{0} \qquad \lambda_2 = \frac{y - 1}{2}$$

$$\lambda_2 = \frac{2 - 4 \cdot 2}{1}$$

from l_2 direction Vector $= \{0, -2, 1\}$

π_2 Normal Vector $= (5, -6, 7)$

$$\cos\theta = \frac{a_1 b_1 + a_2 b_2 + a_3 b_3}{|a||b|}$$

$$(a \cdot b) = \begin{bmatrix} 0 \\ 1 \\ 21/5 \end{bmatrix} \begin{bmatrix} 5 \\ -6 \\ 7 \end{bmatrix}$$

$$= -6 + 29.4 = 23.4$$

S

ation Of Circle

$(x-h)^2 + (y-k)^2 =$

$x = 0 \quad y = b$

$(4, 0)$

$)^2 + (-b)^2 = (r)^2$

$6 + b^2 = r^2$

point $(0, 2)$

$^2 + (2-b)^2 = r$

$16 + b^2 = 4-$

$16 + \cancel{b^2} - \cancel{b^2}$

$12 + 4b$

$4b =$

$\boxed{b =}$

values in Eq

$r^2 = (4)^2 +$

$\boxed{r^2 =}$

$100x$

$^2 = 4ax$

$x = 25$

directrix

$^2 = 24$

$x^2 = 4$

$= 2$

$a =$

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[redacted]

$|a| = \sqrt{1^2 + \left(\frac{21}{5}\right)^2} = 4.3$

$|b| = \sqrt{(5)^2 + (6)^2 + (7)^2} = 10.49$

$\theta = \cos^{-1}\left(\frac{23.4}{4.3 \times 10.49}\right)$

$\theta = \cos^{-1}\left(\frac{23.4}{45.11}\right)$

$\boxed{\theta = 59.34^\circ}$

(D) $\pi_1 \begin{bmatrix} -21/5 \\ 1 \\ 0 \end{bmatrix}, \pi_2 \begin{bmatrix} 5 \\ -6 \\ 7 \end{bmatrix}$

Dot product $= 21 - 6 = -27$

$|a| = \sqrt{(-21/5)^2 + (1)^2} = 4.3$

$|b| = \sqrt{(5)^2 + (-6)^2 + (7)^2} = 10.49$

$\theta = \cos^{-1}\left(\frac{-27}{4.3 \times 10.49}\right) = \theta = 126.78$

$\theta = 180^\circ - 126.76 = \boxed{53.23^\circ}$

(Q5). <u>Mid point</u>

$\left(\frac{-2-6}{2}\right), \left(\frac{-1-3}{2}\right)$

$\left(\frac{-8}{2}, \frac{-4}{2}\right)$

$= (-4, -2)$

Eq → $(x+h)^2 + (y-k)^2 = r^2$

$(x+4)^2 + (y+2)^2 = r^2$

$= (-2+4)^2 + (-1+2)^2 = r^2$

$2^2 + 1^2 = r^2$

$5 = r^2$

$\sqrt{5} = r$

Eq. $(x+4)^2 + (y+2)^2 = 5$

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Q5-

b) Equation Of Circle

$(x-h)^2 + (y-k)^2 = r^2$

If $x = 0$ $y = b$

at point $(4,0)$

$(4)^2 + (-b)^2 = (r)^2$

$16 + b^2 = r^2$

at point $(0,2)$

$(0)^2 + (2-b)^2 = r^2$

$16 + b^2 = 4 - 4b + b^2$

$16 + \cancel{b^2} - \cancel{b^2} - 4 + 4b = 0$

$12 + 4b = 0$

$4b = -12$

$\boxed{b = -3}$

put the values in Eq (1)

$r^2 = (4)^2 + (-3)^2$

$\boxed{r^2 = \pm 5}$

(part c)

$y^2 = 100x$

$y^2 = 4ax$

$a = 25$

Eq of directrix $= x = -a$

$x = -25$

(Part D)

$x^2 = 24y$

$x^2 = 4ay$

$4a = 24$

$a = 8$

so focus $= (a, 0)$

$(8, a)$

Eq of directrix $\boxed{x = -8}$