Q2)

$A = (7i + 4j - k)$ $\quad C = (2i + 7j + 3k)$

$B = (11i + 3j)$ $\quad D = (2i + 7j + dk)$

$AB \times CD = (d-2)i + (4d-12)j - 4k$

unit vector $\Rightarrow \dfrac{AB \times CD}{|AB \times CD|} \times$

$= (-3i + 2j + 4k) \cdot [(d-2)i + (4d-12)j - 4k]$

$3d - 30 \Big/ \sqrt{(d-2)^2 + (4d-12)^2 + 16} = 3$

$d^2 - 5d + 4 = 0$

ii) $d = 1, 4$

$AB \times BD$

$d = 1, \quad n = 5i + 13j - 7k$

$d = 4, \quad n_2 = 8i + 25j - 7k$

BD

$AB \times BD$

$\cos\theta = \dfrac{|n_1 \cdot n_2|}{|n_1||n_2|}$

$= 12.1^\circ$

$AB \times CD =$

$$\begin{vmatrix} i & j & k \\ 4 & -1 & 1 \\ 0 & -1 & d-3 \end{vmatrix}$$

$i\begin{vmatrix} -1 & 1 \\ -1 & d-3 \end{vmatrix} - j\begin{vmatrix} 4 & 1 \\ 0 & d-3 \end{vmatrix}$

$+k\begin{vmatrix} 4 & -1 \\ 0 & -1 \end{vmatrix}$

$(2 \& 3) = \dfrac{6 - 5d - 24 + 8d - 16}{\sqrt{(2-d)^2 + (12-4d)^2 + 4^2}} = 3$

$AB = OB - OA = (11i + 3j) - (7i + 4j - k)$

$= (4i - j + k)$

$CD = OD - OC = 2i + 7j + dk - (2i + 7j + 3k)$

$= (0 - j + (d-3)k)$

(Q3)

$u_1 = r(t\,2 + y) + \lambda(-2\bar{z} - \vec{y})$

$u_2 = (y + t\,k) + \mu(-2j + k)$

Shortest

$a_1 = t\,2 + j$ $\qquad b_1 = -2j - \vec{j}$

$a_2 = j + t\vec{k}$ $\qquad b_2 = -2j + \bar{k}$

$a_2 - a_1 = J(0) + tk - tj = -t\,2 + tk$

$$b_1 \times b_2 = \begin{vmatrix} j & j & k \\ -2 & -1 & 0 \\ 0 & -2 & 1 \end{vmatrix}$$

$= j(1-0) - j(-2-0) + k(4)$

$= j + 2j + 4k$

$|b_1 \times b_2| = \sqrt{21}$

$$Sh = d = \left| \frac{(b_1 \times b_2)\cdot(a_2 - a_2)}{|b_1 \times b_2|} \right|$$

$$= \left| \frac{(j + 2j + 4k)\cdot(-tj + tk)}{\sqrt{21}} \right|$$

$$= \left| \frac{-t + 4t}{\sqrt{21}} \right|$$

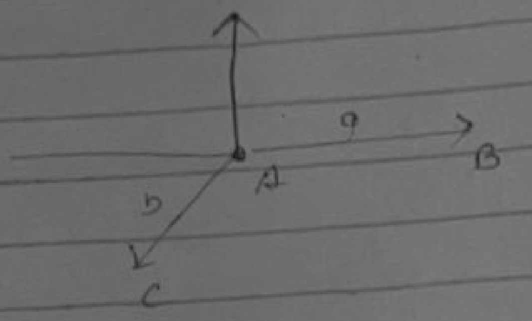
$\left| \frac{3t}{\sqrt{21}} \right| = \sqrt{21}$

$3t = 21 \qquad t = 21/3 \qquad \Rightarrow \boxed{t = 7}$

Assignment

$A = (4i + 4j + k)$, $B = (-4i + 3j - 4k)$

$C = (4i - j - 2k)$



$a = AB$ $\qquad b = AC$

$a = OB - OA = (-4 + 3 - 4) - (4 + 4 + 1)$

$= (-4 - 4 \quad +3 - 4 \quad -4 - 1)$

$= (-8 \quad -1 \quad -5)$

$b = AC = OC - OA = (4 \quad -1 \quad -2) - (4 \quad +4 \quad +1)$

$= (4 - 4 \quad -1 - 4 \quad -2 - 1)$

$= (0 \quad -5 \quad -3)$

$$a \times B = \begin{vmatrix} i & j & k \\ -8 & -1 & -5 \\ 0 & -5 & -3 \end{vmatrix}$$

$$i \begin{vmatrix} -1 & -5 \\ -5 & -3 \end{vmatrix} - j \begin{vmatrix} -8 & -5 \\ 0 & -3 \end{vmatrix} + k \begin{vmatrix} -8 & -1 \\ 0 & -5 \end{vmatrix}$$

$i(.3 - 25) - j(24) + 40k$

$\Rightarrow \frac{\cancel{22}i}{\cancel{2}} - \frac{24j}{2} + \frac{40k}{2} = 0$

$\boxed{-11i - 12j + 20k = d}$

Equation

$$ax + by + cz = d$$

$$a(-11)_x + b(-12)_y + c(20)_z = d$$

$$-11x + (-12)y + 20z = d$$

Putting $A = (4i + 4j + k)$

$$-11(4) + (-12)(4) + 20 = d$$

$$d = -72$$

$$\boxed{11x - 12y + 20z = -72}$$

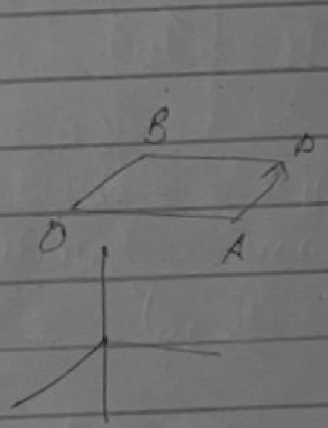
Part:-b

As it is from origin $(0, 0, 0)$

$$d = \left| \frac{-72}{\sqrt{(11)^2 + (-12)^2 + (20)^2}} \right|$$

$$d = 72 / \sqrt{665}$$

$\boxed{d = \text{[illegible]}}$ 2.79



Part c

D = |

$$\frac{x-x_0}{a} = \frac{y-y_0}{b} = \frac{z-z_0}{c} = 0$$

$$\frac{x-2}{-11} = \frac{y-3}{-12} = \frac{z+3}{20} = d$$

$x = 11d+2$, $y = -12d+3$, $z = 20d-3$

$11x - 12y + 20z = 16$

$11(11d+2) - 12(-12d+3) + 20(20d-3) = 16$

$121d + \underline{22} + 144d - 36 + 400 - 60 = 16$

$665d = 90$ $\quad d = 18/133$

Question C

a) $\left(\frac{x}{25}\right)^2 + \left(y/16\right)^2 = 1$

$a = 25$ $\quad b = 16$

$a^2 = (5)^2$ $\quad b = (4)^2$

$a > b$

$\frac{x^2}{a^2} + y/b^2 = 0$

Major = $V(\pm a, 0)$ $(\pm 5, 0)$

Minor = $(a, \pm b)$ $(0, \pm 4)$

$F = (\pm c, 0) = (\pm 3, 0)$

$c = a^2 - b^2$

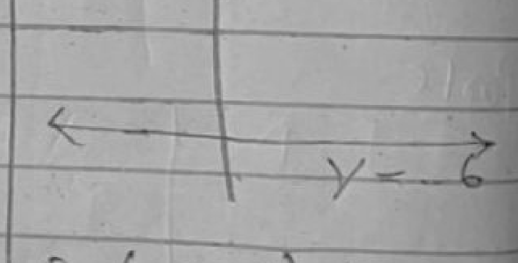
$c^2 = 9$, $c = 3$

b) $x^2 = 24y$

$\cancel{4py} = 24ay$

$p = 6$

$V = (0, 0)$



F $(0, 6)$, y axis, $x = 0$

$(y-k)^2 = 4p(x-h)^2$

$(x)^2 = 4p(x)^2$

$(\cancel{6})^2$

c) $y^2 = 100x$

$4py = 100x$

$p = 100/4$

$\boxed{p = 25}$

$F = (25, 0)$

axis of Parabola x-axis $y = 0$

D.E $= (x = -25)$

d)

Major = 10

M = 8

$c = 0$

$c^2 = a^2 - b^2$

$= 3.21$

As

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 0$$

$a > b$

$a^2 = 10 \qquad b^2 = 8$

$a = 3.21, \quad b = 2.21$

$a > b$

$$\frac{x^2}{(a)^2} + \frac{y^2}{(8)^2} = 0$$

$V = (\pm 3.21, 0)$

$V = (0, \pm 2.20)$

$F = (\pm c, 0) \quad F = (\pm 0.62, 0)$

b)

If center at y

$(0, b)$

$x^2 + y^2 = r^2$

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

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

And

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

~~$(b-2)^2 =$~~

~~$b^2 + 4 - 4b$~~

Comparing

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

$(-2)(2b-2) = 16$

$b = -3$

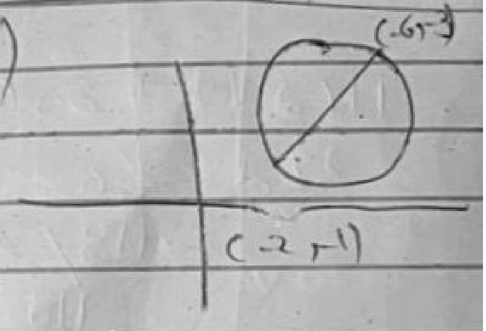
So

$r^2 = 4^2 + 3^2$

$r^2 = 25$

$\boxed{r = 5}$

a)



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

$= (-4, -2)$

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

Put $(-2, -1)$

$r^2 = 5$

$r = \sqrt{5}$

$$\boxed{(x+4)^2 + (y+2^2) = \sqrt{5}}$$

Q1(c)

$$OD = \overset{a\ \ b\ \ c}{(2, 3, -3)} - \overset{x_0\ \ y_0\ \ z_0}{(0, 0, 0)}$$

$$\frac{x - x_0}{a} = \frac{y - y_0}{b} = \frac{z - z_0}{c} -$$

$$\frac{x - 0}{2} = \frac{y - 0}{3} = \frac{z - 0}{-3} = \lambda$$

$x = 2\lambda$; $y = 3\lambda$ $z = -3\lambda$

$$C \Rightarrow \left(\frac{72}{59}, \frac{108}{59}, \frac{-216}{59}\right)$$

$-11x - 12y + 20z = 16$

$-11(2\lambda) + 20(-3\lambda) - 12(3\lambda) = 16$

$-22\lambda - 60\lambda - 36\lambda = 16$

$\cancel{-}118\cancel{-}74\lambda = \cancel{-}72$

$118\lambda = 72$

$\lambda = 72/118 = 36/59$

$x = 2(36/59)$ $y = 3(36/59)$ $z = -3(36/59)$

$= 72/59$ $y = 108/59$ $z = -216/59$