

Applied math - Problems

Part 1



2)  $\odot = +$        $\ominus = -$

3) See Figure 3

4) a)  $\cos \alpha = \frac{x_1}{L_1}$

b)  $x_1 = L_1 \cos(\alpha)$

c)  $\cos(\alpha + \beta) = \frac{x_2 - x_1}{L_2} = \cos(\alpha + \beta) = \frac{x_2 - L_1 \cos(\alpha)}{L_2}$

d)  $\cos(\alpha + \beta) = \frac{x_2 - L_1 \cos(\alpha)}{L_2}$   
 $= L_2 \cos(\alpha + \beta) = x_2 - L_1 \cos(\alpha)$   
 $x_2 = L_2 \cos(\alpha + \beta) + L_1 \cos(\alpha)$

5)  $y_2 = L_2 \sin(\alpha + \beta) + L_1 \sin(\alpha)$

$x_2 y_2 = (L_2 \cos(\alpha + \beta) + L_1 \cos(\alpha), L_2 \sin(\alpha + \beta) + L_1 \sin(\alpha))$

Part 2

6.a)  $6 = 3 \cos(\alpha + \beta) + 5 \cos(\alpha)$

$2 = 3 \sin(\alpha + \beta) + 5 \cos(\alpha)$

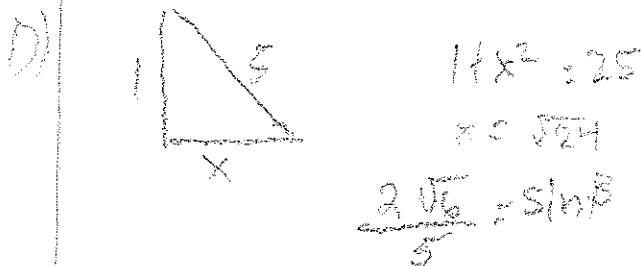
b)  $36 = 9 \cos^2(\alpha + \beta) + 30 \cos(\alpha + \beta) \cos(\alpha) + 25 \cos^2(\alpha)$

$4 = 9 \sin^2(\alpha + \beta) + 30 \sin(\alpha + \beta) \sin(\alpha) + 25 \sin^2(\alpha)$

$$B) \quad 40 = 34 + 30 (\cos(\alpha + \beta) \cos(\alpha) + \sin(\alpha + \beta) \sin(\alpha))$$

$$G = 30 ((\cos(\alpha + \beta) \cos(\alpha) + \sin(\alpha + \beta) \sin(\alpha))$$

$$C) \quad \frac{1}{5} = \cos \beta$$



$$E) \quad \cos^{-1} \frac{1}{5} = \beta$$

$$\beta = 78.463^\circ$$

Part 3

$$7) a) \quad x^2 = 3 \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta + 5 \cos \alpha$$

$$y^2 = 3 \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta + 5 \sin \alpha$$

$$B) \quad x^2 = 3 (\cos \alpha) \cdot \frac{1}{5} - 3 \sin \alpha \cdot \frac{2\sqrt{6}}{5} + 5 \cos \alpha$$

$$5.6 \cos \alpha - 3 \sin \alpha \cdot \left(\frac{2\sqrt{6}}{5}\right)$$

$$y^2 = 3 \sin \alpha \cdot \frac{1}{5} + 3 \cos \alpha \cdot \frac{2\sqrt{6}}{5} + 5 \sin \alpha$$

$$y^2 = 5.6 \sin \alpha + \frac{6\sqrt{6}}{5} \cos \alpha$$

7C

$$D = \begin{vmatrix} 5.6 & -\frac{6\sqrt{6}}{5} \\ \frac{6\sqrt{6}}{6} & 5.6 \end{vmatrix} = 31.36 + 8.64 = 40$$

$$\cos \alpha = x \quad \sin \alpha = y$$

$$D_x \begin{vmatrix} 6 & \frac{6\sqrt{6}}{5} \\ 2 & 5.6 \end{vmatrix} + \frac{33.6}{5.88} = x = 30.987$$

$$D_y \begin{vmatrix} 5.6 & 6 \\ \frac{6\sqrt{6}}{5} & 2 \end{vmatrix} = \frac{11.2}{\frac{17.64}{40}} = -0.161$$

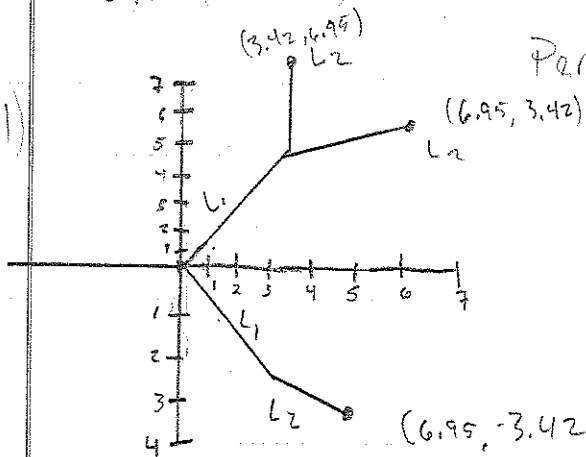
$$(6) \quad 5(0.294) \frac{1}{5} - 3(-0.56) \frac{2\sqrt{6}}{5} + 5(0.294) = 6$$

$$(7) \quad 3(-0.56) \frac{1}{5} + 3(0.294) \frac{2\sqrt{6}}{5} + 5(-0.56) = 2$$

7D

$$\cos^{-1}(\dots) = 9.25^\circ$$

$$\sin^{-1}(\dots) = -9.26^\circ$$



Part 4

$$x_2 = 5(\cos 75^\circ) + 3(\cos 145^\circ)$$

$$y_2 = 5(\sin 75^\circ) + 3(\sin 145^\circ)$$

$$x_2 = 3.42$$

$$y_2 = 6.95$$

$$y_2 = 5(\cos(-15^\circ)) + 3(\cos(-45^\circ)) = 6.95$$

$$y_2 = 5(\sin(-15^\circ)) + 3(\sin(-45^\circ)) = -3.42$$

$$x_2 = 5(\cos 15^\circ) + 3(\cos 45^\circ) = 6.95$$

$$y_2 = 5(\sin 15^\circ) + 3(\sin 45^\circ) = -3.42$$