HW 1

1. $3x-4y-12z-1=0$ $\quad -3x+4y+12z+1=0$

(a) $D_0 = 1$ $\quad \underline{S} = [-3, 4, 12]$

$$\alpha = \frac{-3}{\sqrt{3^2+4^2+12^2}} = \frac{-3}{13}$$

$$\beta = \frac{4}{\sqrt{3^2+4^2+12^2}} = \frac{4}{13}$$

$$\gamma = \frac{12}{\sqrt{3^2+4^2+12^2}} = \frac{12}{13}$$

(b) $$|P| = \frac{|-D_0|}{|\underline{S}|} = \frac{1}{13} \text{ m}$$

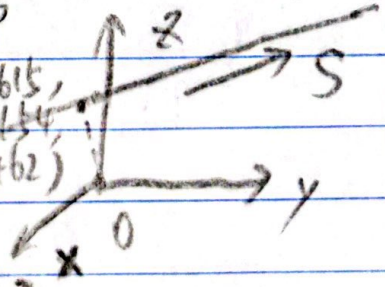
(c) $\underline{S} = [-3, 4, 12]$ $\quad D_0 = 0$ pass through origin

$-3x+4y+12z=0$ $\quad [0; 3, -4, 12]$

2. (a) $\{-4, 12, 3 ; -24, -6, -8\}$

$\underline{S} = [-4, 12, 3]$ $\quad \underline{S_{OL}} = [-24, -6, -8]$

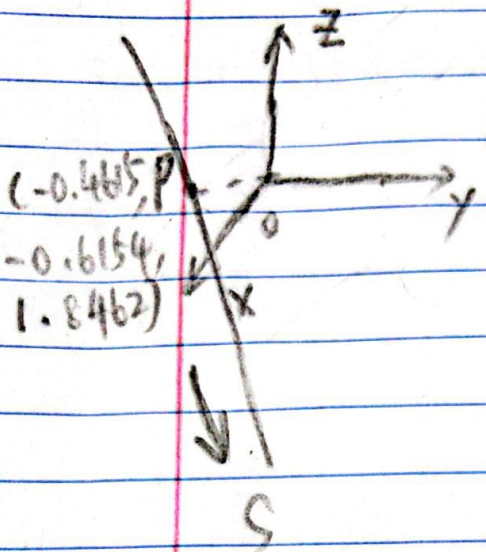
$$|P| = \frac{|\underline{S_{OL}}|}{|\underline{S}|} = 2 \text{ m}$$



(b) $\{3, 4, -12 ; 16, 27, 13\}$

$\underline{S} = [3, 4, -12]$ $\quad \underline{S_{OL}} = [16, 27, 13]$

$$|P| = \frac{|\underline{S_{OL}}|}{|\underline{S}|} = 2.6131 \text{ m}$$



3. $-4x + 12y + 3z + 1 = 0$

$3x + 4y - 12z + 1 = 0$

$[1; -4, 12, 3]$ $[1; 3, 4, -12]$

$\underline{S}_1 = [-4, 12, 3]$ $\underline{S}_2 = [3, 4, -12]$

$D_{01} = 1\,m$ $D_{02} = 1\,m$

The planes are perpendicular when $S_1 \cdot S_2 = 0$

$\underline{S}_3 = \underline{S}_1 \times \underline{S}_2$

$\underline{S}_{OL3} = (-D_{02})\underline{S}_1 - (-D_{01})\underline{S}_2$

$L = \{\underline{S}_3, \underline{S}_{OL3}\} = \{-156 \; -59 \; -52 \; ; \underbrace{7, -8, -15}_{m}\}$

$\cos\theta = \dfrac{\underline{S}_1 \cdot \underline{S}_2}{\|\underline{S}_1\| \times \|\underline{S}_2\|}$ $\theta = 90°$ perpendicular

4. $\underline{r} \times \underline{S} = \underline{S}_{OL}$ $\underline{S} = (-4, 12, 3)$

$\underline{r}_0 = \underline{0}$ (origin) $\underline{S}_{OL} = (-24, -6, -8)$

$\underline{r} \cdot \underline{S}_{OL} = 0$

$-24x - 6y - 8z = 0$ $[0; -24, -6, -8]$

t. $\{3, 4, -12; 16, 27, 13\}$
$[1; 4, 1, 5]$

$$\underline{r}_0 = \frac{\underline{S}_2 \times \underline{S}_{OL1} - \underline{D}_{O2} \cdot \underline{S}_1}{\underline{S}_1 \cdot \underline{S}_2}$$

$$\underline{r}_0 = (1, 2.8409, -0.5455, -2.3636)$$

m

(See MATLAB files for functions)