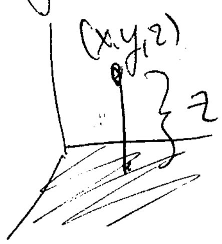
HW01 SOLNS

~~HC~~
13.1: 10, ~~14~~, ~~16~~, 34, 36
13.2: 6, 14, ~~22~~, 30, 34
13.3: 2, 22, ~~26~~, 32, ~~38~~

10. Find distance of $(3,7,-5)$ to

a) xy-plane

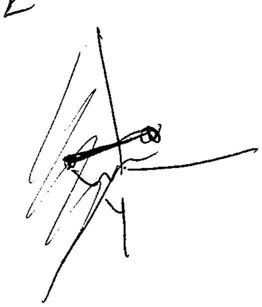


~~answer~~
distance to xy-plane $= 5$

b) yz-plane

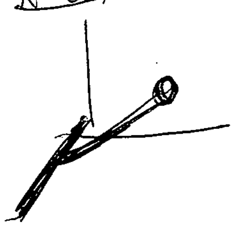
distance to yz-plane $= 3$

c)



distance to xz-plane $= 7$

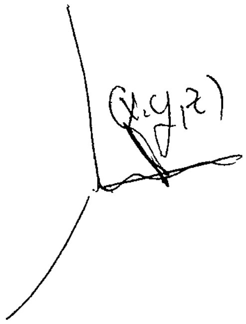
d) ~~x axis~~



distance to x-axis $= \sqrt{y^2+z^2}$

$= \sqrt{49+25} = \sqrt{74}\ \cancel{=8}.$

e)

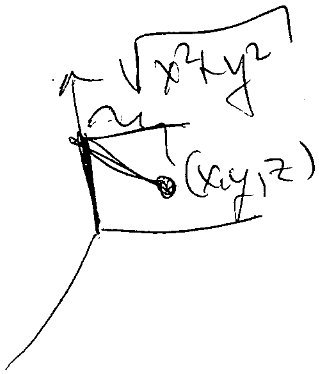


distance to y-axis $= \sqrt{x^2+z^2}$

$= \sqrt{3^2+5^2}$

$= \sqrt{9+25} = \sqrt{34}$.

f)



distance to z-axis $= \sqrt{x^2+y^2}$

$= \sqrt{3^2+7^2}$

$= \sqrt{9+49} = \sqrt{58}$.

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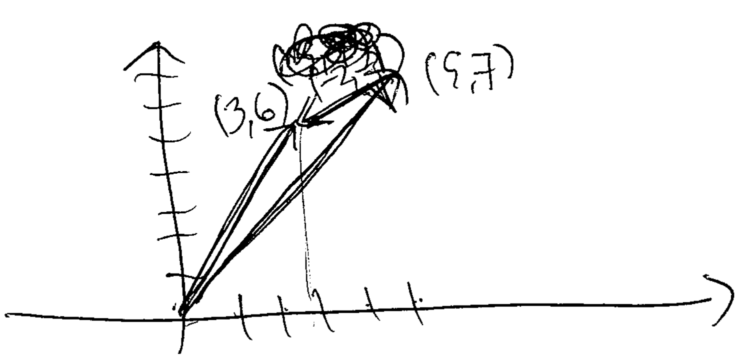
34. Solid cylinder that lies on region below $z=8$ & above $z=0$ centered at origin of radius 2.

$\{(x,y,z) \in \mathbb{R}^3 \mid 0 \le z \le 8 \text{ \& } x^2+y^2 \le 4\}$.

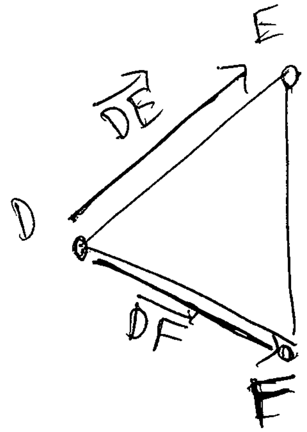
13.2; 14: find the sum of the vectors (-2,-1) & (5,7) & illustrate geometrically



$(5,7)+(-2,-1) = (3,6)$

NOT A FUN PROBLEM

13.3:22 Find the angles of the triangle formed by the points $D=(0,1,1)$, $E=(-2,4,3)$, $F=(1,2,-1)$.



$$\angle EDF = \cos^{-1}\left(\frac{\vec{DE}\cdot\vec{DF}}{|\vec{DE}||\vec{DF}|}\right)$$

$$\angle DEF = \cos^{-1}\left(\frac{\vec{ED}\cdot\vec{EF}}{|\vec{ED}||\vec{EF}|}\right)$$

$$\underbrace{\angle EFD = \frac{\pi}{2} - \left(\angle EDF + \angle DEF\right)}_{\text{formulas used to get angles.}}$$

$\vec{DE} = E - D = (-2,4,3)-(0,1,1)$ $\quad (= -\vec{ED})$

$= (-2,3,2),$

$\vec{DF} = F - D = (1,2,-1) - (0,1,1)$

$= (1,1,-2)$ $\quad (= -\vec{FD})$

$\vec{EF} = F - E = (1,2,-1) - (-2,4,3)$

$= (3,-2,-4).$ $\quad (= -\vec{FE})$

$\cancel{\angle EDF = \cos^{-1}\left(\frac{\vec{DE}\cdot\vec{DF}}{|\vec{DE}||\vec{DF}|}\right)}$

Info we need

$|\vec{DE}| = |(-2,3,2)| = \sqrt{4+9+4} = \sqrt{17}$

$|\vec{DF}| = |(1,1,-2)| = \sqrt{1+1+4} = \sqrt{6}$

$|\vec{EF}| = |(3,-2,-4)| = \sqrt{9+4+16} = \sqrt{29}$

$\vec{DE} \cdot \vec{DF} = (-2,3,2) \cdot (1,1,-2) = -2+3-4$

$= -3$

$\vec{ED} \cdot \vec{EF} = (2,-3,-2) \cdot (3,-2,-4) = 6+6+8 = \cancel{40}\ 20$

$\therefore$

$$\angle EDF = \cos^{-1}\left(\frac{\vec{DE} \cdot \vec{DE}}{|\vec{DE}||\vec{DF}|}\right)$$

$$= \cos^{-1}\left(\frac{-3}{\sqrt{17}\sqrt{6}}\right) \approx \cancel{1.88 \text{ radians}}\ 1.87 \text{ radians}$$

or 107.28 deg

$$\angle DEF = \cos^{-1}\left(\frac{\vec{ED} \cdot \vec{EF}}{|\vec{ED}||\vec{EF}|}\right)$$

$$= \cos^{-1}\left(\frac{\cancel{40}\ 20}{\cancel{9}\ \sqrt{17} \cdot \sqrt{29}}\right) \approx .44 \text{ rad} \quad 25.74 \text{ deg}$$

$180^\circ - 107.28 - 25.74 = 3^{rd}$ Angle

33. (give direction cosines!) $\frac{\pi}{2} \approx 1.57$ radians.

$$\frac{(c,c,c)\cdot\hat{i}}{|(c,c,c)||\hat{i}|} = \frac{c}{\sqrt{3c^2}} = \frac{1}{\sqrt{3}} = \cos(\alpha); \quad \alpha \approx .9553 \text{ (radians)}$$

the other direction angles are the same.

$$2i - j + 2k = \vec{v}. \qquad |\vec{v}| = \sqrt{4+1+4} = \sqrt{9} = 3$$

$$\frac{\vec{v}\cdot\hat{i}}{|\vec{v}|} = \frac{2}{3} = \cos(\alpha)$$

$$\frac{\vec{v}\cdot\hat{j}}{|\vec{v}|} = \frac{-1}{3} = \cos(\beta)$$

$$\frac{\vec{v}\cdot\hat{k}}{|\vec{v}|} = \frac{2}{3} = \cos(\gamma)$$