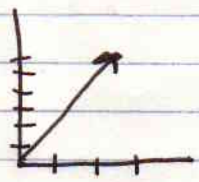
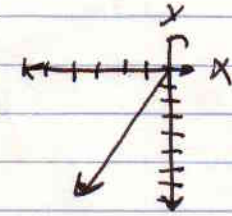
3.1

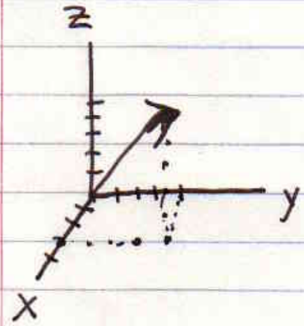
2a.

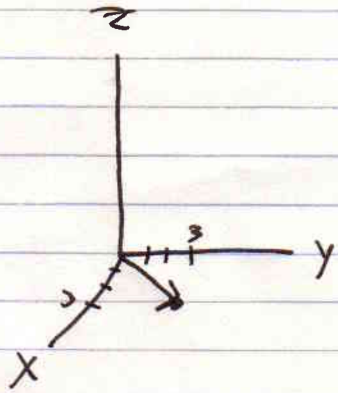


b.



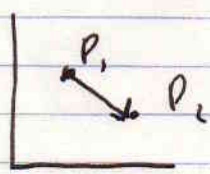
g.





3.a. let $P_1 = (x_1, y_1, z_1)$ $P_2(x_2, y_2, z_2)$

$\overrightarrow{P_1P_2} = (x_2 - x_1, y_2 - y_1, z_2 - z_1)$



$= (3,7) - (4,8) = (3-4, 2-8) = (-1,-1)$

b. $(-4,-7) - (3,-5) = (-7,-2)$

e. $(-2,5,-4) - (3,-7,2) = (-5, 12, -6)$

f. $(0,-1,0) - (-1,0,2) = (1,-1,-2)$

4. $u = \overrightarrow{PQ}$ $P = (-1,3,-5)$ let $u = 1 \cdot v$

could be any scalar > 0

then $\vec{u} = \vec{Q} - \vec{P}$ $\vec{Q} = \vec{u} + \vec{P}$

$= (5, 10, -8)$

b. $\vec{u} = -1 \cdot \vec{v} = (-6,-3,3) = (-7,-4,-2)$

any scal < 0

6.a. $\vec{v} - \vec{w} = (4, 0, -8) + -1(6, -1, -4) = (-2, 1, -4)$

b. $6\vec{u} + 2\vec{v} = 6 \cdot (-3, 1, 2) + 2(4, 0, -8) = (-10, 6, -4)$

e. $-3(v - 8w) = -3((4, 0, -8) - 8(6, -1, -4))$

$= -3(-44, 8, 24) = (132, -24, -72)$

f. $(2(-3, 1, 2) - 7(6, -1, -4)) - 8(4, 0, -8) - (-3, 1, 2)$

$= (-6, 2, 4) + (-42, 7, 28) + (-32, 0, 64) + (3, -1, -2)$

28
62

$= (-77, 8, 94)$

8. $\vec{u} = (u_1, u_2, u_3)$ $\quad \vec{v}(v_1, v_2, v_3)$ $\quad \vec{w}(w_1, w_2, w_3)$

$c_1(u_1, u_2, u_3) + c_2(v_1, v_2, v_3) + c_3(w_1, v_2, w_3) = (2, 0, 4)$

So divy up into components

like $c_1 u_1 + c_2 v_1 + c_3 w_1 = 2$

so

$-3c_1 + 4c_2 + 6c_3 = 2$
$1c_1 + 0c_2 - 1c_3 = 0$
$2c_1 - 8c_2 - 4c_3 = 4$

Matrix $\begin{bmatrix} -3 & 4 & 6 \\ 1 & 0 & -1 \\ 2 & -8 & -4 \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \\ c_3 \end{bmatrix} = \begin{bmatrix} 2 \\ 0 \\ 4 \end{bmatrix}$

inverse

$\begin{bmatrix} c_1 \\ c_2 \\ c_3 \end{bmatrix} = \begin{bmatrix} 1/2 & 2 & 1/4 \\ -1/4 & 0 & 3/16 \\ 1/2 & 1 & 1/2 \end{bmatrix} \begin{bmatrix} 2 \\ 0 \\ 4 \end{bmatrix} = \begin{bmatrix} 3 \\ -1 \\ 2 \end{bmatrix}$

9. as before, we convert into matricies:

Component equations:

ex: $-2c_1 \quad -3c_2 + c_3 = 0$

so

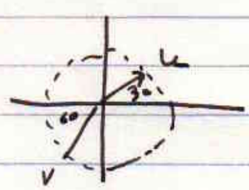
$$\begin{bmatrix} -2 & -3 & 1 \\ 9 & 2 & 7 \\ 6 & 1 & 5 \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \\ c_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 5 \\ 4 \end{bmatrix}$$

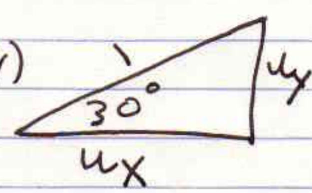
Note:

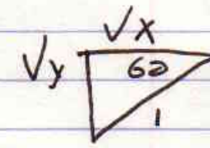
Column 3 = Column 1 − Column 2

So, matrix is not invertible.

So, there is no solution for c_1, c_2, c_3

14. 

$u = (x, y)$ 



$u_x = 1 \cdot \cos(30) = \frac{\sqrt{3}}{2}$ $\qquad u_y = 1 \cdot \sin(30) = \frac{1}{2}$

$u = \left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ $\qquad V_x = -1 \cdot \cos 60 = -\frac{1}{2}$

$v\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$ $\qquad V_y = -1 \cdot \sin 60 = -\frac{\sqrt{3}}{2}$

$u + v = \left(\frac{\sqrt{3}-1}{2}, \frac{1-\sqrt{3}}{2}\right)$ $\qquad u - v = \left(\frac{\sqrt{3}+1}{2}, \frac{\sqrt{3}+1}{2}\right)$