TBM 7B, 11.11.2015

1 a) $\left(-\frac{1}{3}\right) \cdot \begin{pmatrix} -6 \\ 4 \\ 9 \end{pmatrix} = \begin{pmatrix} 2 \\ -4/3 \\ -3 \end{pmatrix}$ JA

b) $\begin{pmatrix} 6 \\ -4 \\ -2 \end{pmatrix} \begin{matrix} \xrightarrow{\cdot 1/2} \\ \xrightarrow{\cdot 1/2} \\ \xrightarrow{\cdot 0} \end{matrix} \begin{pmatrix} 3 \\ -2 \\ 0 \end{pmatrix}$ NEIN

2 a) $\vec{v} = \begin{pmatrix} -6 \\ 2 \\ 3 \end{pmatrix}$, $\vec{w} = \frac{\vec{v}}{v} = \frac{1}{\sqrt{6^2+2^2+3^2}} \begin{pmatrix} -6 \\ 2 \\ 3 \end{pmatrix}$

$= \frac{1}{7} \begin{pmatrix} -6 \\ 2 \\ 3 \end{pmatrix} = \begin{pmatrix} -6/7 \\ 2/7 \\ 3/7 \end{pmatrix}$

b) $\vec{v} = \begin{pmatrix} -2 \\ -2 \\ -2 \end{pmatrix}$, $\vec{w} = \frac{1}{\sqrt{2^2+2^2+2^2}} \begin{pmatrix} -2 \\ -2 \\ -2 \end{pmatrix}$

$\sqrt{12} = 2\sqrt{3}$; $\frac{1}{2\sqrt{3}} = \frac{\sqrt{3}}{2 \cdot \sqrt{3} \cdot \sqrt{3}} = \frac{\sqrt{3}}{6}$

$\vec{w} = \frac{\sqrt{3}}{6} \begin{pmatrix} -2 \\ -2 \\ -2 \end{pmatrix} = \begin{pmatrix} -\sqrt{3}/3 \\ -\sqrt{3}/3 \\ -\sqrt{3}/3 \end{pmatrix}$

$\cancel{-\sqrt{3}/3 \neq -1/\sqrt{3} =}$

$\frac{1}{\sqrt{12}} = \frac{\sqrt{12}}{12} = \frac{1}{2\sqrt{3}} = \frac{\sqrt{3}}{6}$

$-2/\sqrt{12} = -\frac{\sqrt{12}}{6} = -1/\sqrt{3} = -\sqrt{3}/3$

3 $\vec{w} = -10 \cdot \frac{1}{\sqrt{1^2+0^2+2^2}} \begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix}$

$= -10 \; \frac{1}{\sqrt{5}} \begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix} \qquad \frac{1}{\sqrt{5}} = \frac{\sqrt{5}}{5}$

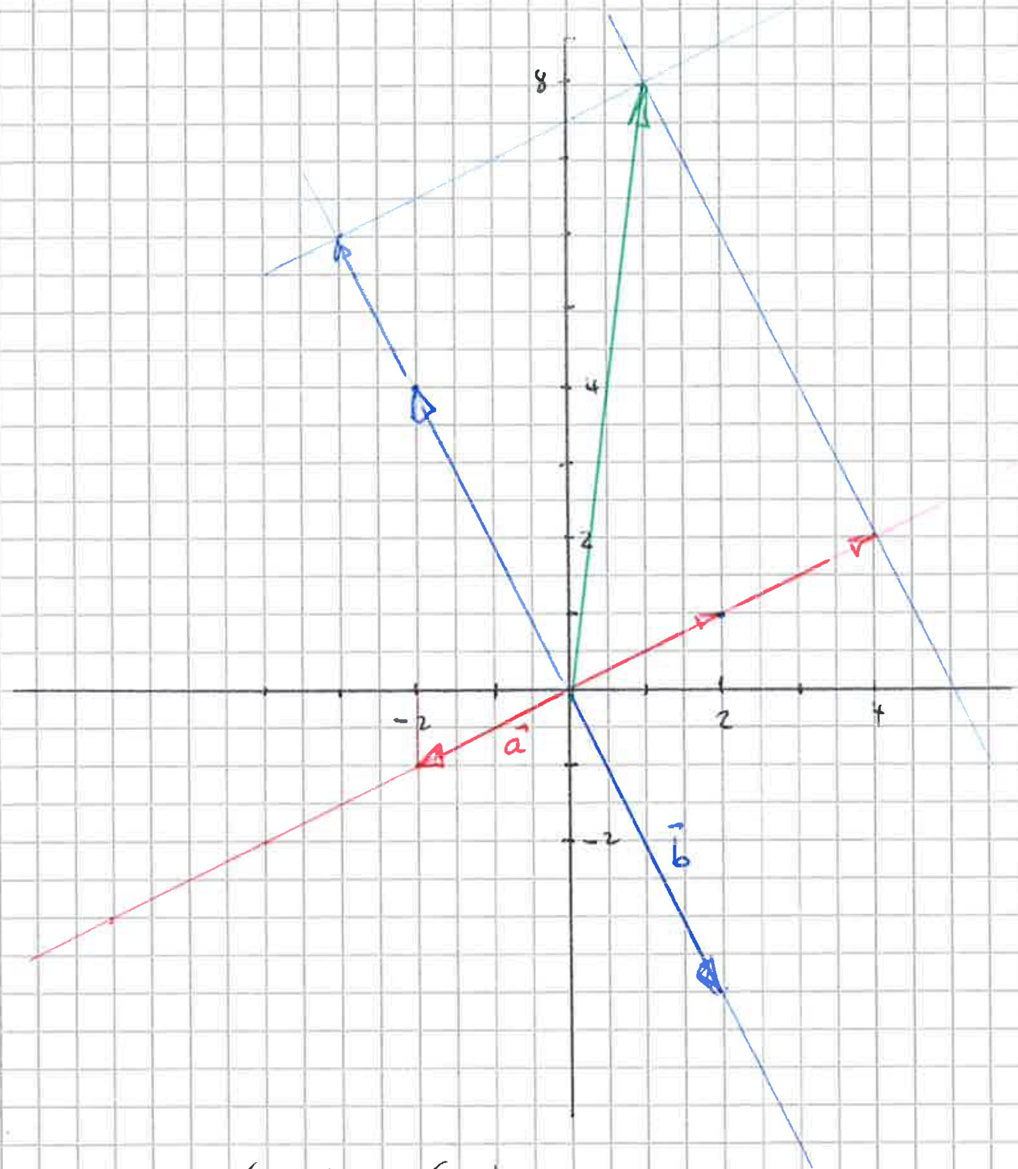
$= -10 \cdot \frac{\sqrt{5}}{5} \begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix} = -2\sqrt{5} \begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix} = \underline{\underline{\begin{pmatrix} -2\sqrt{5} \\ 0 \\ 4\sqrt{5} \end{pmatrix}}}$

$\begin{pmatrix} -10/\sqrt{5} \\ 0 \\ +2 \cdot 10/\sqrt{5} \end{pmatrix} = \begin{pmatrix} -10/\sqrt{5} \\ 0 \\ +20/\sqrt{5} \end{pmatrix}$

4 $\left\| \begin{pmatrix} 3 \\ -4 \\ 8 \end{pmatrix} - \begin{pmatrix} -9 \\ -8 \\ 5 \end{pmatrix} \right\| = \left\| \begin{pmatrix} 12 \\ 4 \\ 3 \end{pmatrix} \right\| = \sqrt{12^2+4^2+3^2}$

$= \sqrt{169} = \underline{\underline{13}}$

5



$$s\begin{pmatrix}-2\\-1\end{pmatrix}+t\begin{pmatrix}2\\-4\end{pmatrix}=\begin{pmatrix}1\\8\end{pmatrix}$$

$$-2s+2t=1$$

$$-s-4t=8 \quad |\cdot(-2)$$

$$-2s+2t=1$$

$$2s+8t=-16$$

$$10t=-15$$

$$t=-\frac{3}{2}=-1.5$$

$$-2s+2(-1.5)=1$$

$$2s=-4$$

$$s=-2$$

$$\vec{c}=\begin{pmatrix}1\\8\end{pmatrix}=\begin{pmatrix}4\\2\end{pmatrix}+\begin{pmatrix}-3\\6\end{pmatrix}$$

$$\underline{\underline{\vec{c}=-2\vec{a}-1.5\vec{b}}}$$

(6) $\vec{r}_P = \begin{pmatrix} -2 \\ 2 \\ -1 \end{pmatrix} \quad \vec{r}_Q = \begin{pmatrix} 0 \\ y \\ 0 \end{pmatrix}$

$$\vec{PQ} = \vec{r}_Q - \vec{r}_P = \begin{pmatrix} 0 \\ y \\ 0 \end{pmatrix} - \begin{pmatrix} -2 \\ 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 2 \\ y-2 \\ 1 \end{pmatrix}$$

$$\overline{PQ} = 3 \Rightarrow \sqrt{2^2 + (y-2)^2 + 1^2} = 3 \quad | x^2$$

$$2^2 + (y-2)^2 + 1^2 = 9$$

$$y^2 - 4y + 4 + 4 + 1 = 9 \quad | -9$$

$$y^2 - 4y = 0$$

$$y(y-4) = 0$$

$$y_1 = 0 \qquad y_2 = 4$$

$$\underline{\underline{Q_1(0/0/0);\ Q_2(0/4/0)}}$$

(7) $\vec{r}_M = \vec{r}_A + \vec{AM}; \quad \vec{AM} = \vec{BC} = \vec{r}_C - \vec{r}_B$

$$\underline{\underline{\vec{r}_M = \vec{r}_A + \vec{r}_C - \vec{r}_B}}$$

$$\vec{r}_P = \vec{r}_A + \frac{1}{2}\vec{AF}; \quad \vec{AF} = \vec{BM} = \vec{BA} + \vec{AM}; \quad \vec{AM} = \vec{BC}$$

$$\vec{AF} = \vec{BA} + \vec{BC}$$

$$= \vec{r}_A - \vec{r}_B + \vec{r}_C - \vec{r}_B$$

$$= \vec{r}_A - 2\vec{r}_B + \vec{r}_C$$

$$\vec{r}_P = \vec{r}_A + \frac{1}{2}(\vec{r}_A - 2\vec{r}_B + \vec{r}_C)$$

$$= \vec{r}_A + \frac{1}{2}\vec{r}_A - \vec{r}_B + \frac{1}{2}\vec{r}_C$$

$$\underline{\underline{\vec{r}_P = \frac{3}{2}\vec{r}_A - \vec{r}_B + \frac{1}{2}\vec{r}_C}}$$