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Morgan Saville

Supervision Work 1

A10) a) $\vec{r} = \vec{a} + \lambda(\vec{b} - \vec{a})$

b) $\vec{r} = \begin{pmatrix}1\\1\\0\end{pmatrix} + \lambda\left(\begin{pmatrix}3\\1\\4\end{pmatrix} - \begin{pmatrix}1\\1\\0\end{pmatrix}\right)$

$= \begin{pmatrix}1\\1\\0\end{pmatrix} + \lambda\begin{pmatrix}2\\0\\4\end{pmatrix}$ $\rightarrow$ $\begin{pmatrix}1+2\lambda\\1\\4\lambda\end{pmatrix}$ then check for a $\vec{a}$ & λ that fits.

Suppose $\vec{r} = \begin{pmatrix}-2\\0\\4\end{pmatrix} = \begin{pmatrix}1\\1\\0\end{pmatrix} + \lambda\begin{pmatrix}2\\0\\4\end{pmatrix}$ hmm don't like that too much.

$\therefore$ ~~$-2 = 1 + 2\lambda$~~ $0 = 1 + 0\lambda = 1$

$\therefore$ ~~$\lambda = -\frac{3}{2}$~~ which is a contradiction

Suppose $\vec{r} = \begin{pmatrix}5\\1\\8\end{pmatrix} = \begin{pmatrix}1\\1\\0\end{pmatrix} + \lambda\begin{pmatrix}2\\0\\4\end{pmatrix}$

$\therefore 5 = 1 + 2\lambda$ $\quad 8 = 0 + 4\lambda$ $\quad 1 = 1 + 0\lambda$

$\therefore \lambda = 2$ $\quad \therefore \lambda = 2$

$\therefore$ no contradiction

Suppose $\vec{r} = \begin{pmatrix}1\\1\\-4\end{pmatrix} = \begin{pmatrix}1\\1\\0\end{pmatrix} + \lambda\begin{pmatrix}2\\0\\4\end{pmatrix}$

$\therefore 1 = 1 + 2\lambda$ $\quad -4 = 0 + 4\lambda$

$\therefore \lambda = 0$ $\quad \therefore \lambda = -1$

which is a contradiction

Suppose $\vec{r} = \begin{pmatrix}-1/2\\1/2\\2\end{pmatrix} = \begin{pmatrix}1\\1\\0\end{pmatrix} + \lambda\begin{pmatrix}2\\0\\4\end{pmatrix}$

$\therefore \frac{1}{2} = 1 + 0\lambda = 1$

which is a contradiction

$\therefore$ only $\vec{r} = \begin{pmatrix}5\\1\\8\end{pmatrix}$ is on the line through $\vec{a}$ and $\vec{b}$