Ex 1 Find the equation of the line passing through the points $(3, -1)$ and $(5, 7)$ in:

(a) Slope-intercept form

(b) Point-slope form

(c) Component form

(d) Parametric form

Ex 2 Consider the line passing through the points $(1, 2, 3)$ and $(6, 5, 4)$.

(a) Is is possible to write the equation of this line in slope-intercept form? If so, write the equation of this line in slope-intercept form. If not, explain why not.

(b) Is is possible to write the equation of this line in point-slope form? If so, write the equation of this line in point-slope form. If not, explain why not.

(c) Is is possible to write the equation of this line in component form? If so, write the equation of this line in component form. If not, explain why not.

(d) Is is possible to write the equation of this line in parametric form? If so, write the equation of this line in parametric form. If not, explain why not.

(e) Is it possible to find two different equations for this line which use the same form? (E.g. two different equations in slope-intercept form? Or two different equations in component form?) If so, find two different equations for this line which use the same form. If not, explain why not.

Ex 3 Find the equation of a line which passes through the point $(-1, 0, -1)$ and intersects the line

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = t \begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$$

at...

(a) ...the point $(-2, 4, -4)$.

(b) ...a distance three units from the origin. Note: there are two correct answers to this part of this problem.

Ex 4 Let

$$\vec{u} = \begin{pmatrix} 0 \\ -1 \end{pmatrix}, \quad \vec{v} = \begin{pmatrix} -2 \\ 4 \end{pmatrix}, \quad \text{and} \quad \vec{w} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}.$$

For each of the following computations, either explain why the computation does not make sense OR do the computation.

(a) $\vec{u} \cdot \vec{v}$

(b) $\vec{u} \cdot \vec{w}$

(c) $(\vec{u} \cdot \vec{v})\vec{w}$

(d) $\vec{u} + 3$

(e) $\vec{u} \cdot \vec{v} + 3$

(f) $\vec{u} + \vec{v} + 3$

(g) $\frac{1}{\|\vec{u}\|}\vec{u} + \frac{1}{\|\vec{w}\|}\vec{v}$

Ex 5 What is the included angle between vectors

$$\vec{u} = \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix} \quad \text{and} \quad \vec{v} = \begin{pmatrix} 3 \\ -2 \\ 0 \\ 1 \end{pmatrix}?$$

Ex 6 Let

$$\vec{u} = \begin{pmatrix} 1 \\ 2 \end{pmatrix} \quad \text{and} \quad \vec{v} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}.$$

(a) Draw the vectors $\vec{u}, \vec{v}$, and $\text{proj}_{\vec{u}}\, \vec{v}$ on the same axes.

(b) Draw the vectors $\vec{u}, \vec{v}$, and $\text{proj}_{\vec{v}}\, \vec{u}$ on the same axes.