

**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 it 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 it 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 it 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 it 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 distance three units from the origin. Note: there are two correct answers to 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

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

- (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.