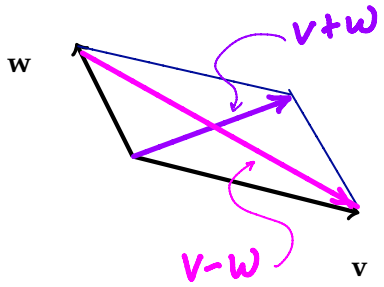
This quiz has two problems worth 10 points.

1. (4 points) The vectors $\mathbf{v}$ and $\mathbf{w}$ are drawn below. Sketch and label the vectors $\mathbf{v}+\mathbf{w}$ and $\mathbf{v}-\mathbf{w}$.



2. (6 points)

(a) Express the question below as two equations with coefficients c and d.

Is there a linear combination of $\mathbf{v} = \begin{bmatrix} 9 \\ -3 \end{bmatrix}$ and $\mathbf{w} = \begin{bmatrix} -5 \\ 3 \end{bmatrix}$ that equals $\mathbf{b} = \begin{bmatrix} 7 \\ -7 \end{bmatrix}$?

Are there coefficients c and d so that

$c\vec{v} + d\vec{w} = \vec{b}$? Or equivalently

$$c\begin{bmatrix} 9 \\ -3 \end{bmatrix} + d\begin{bmatrix} -5 \\ 3 \end{bmatrix} = \begin{bmatrix} 7 \\ -7 \end{bmatrix} \; ?$$

(b) Solve for c and d or explain why no solution exists.

Turn the vector equation into a system of linear equations:

① $9c - 5d = 7$

② $-3c + 3d = -7$

So $9c - 5d = 7$

$-9c + 9d = -21$

$4d = -14$ or $\boxed{d = \frac{-7}{2}}$

So, plug into equation 2:

$-3c + 3\left(\frac{-7}{2}\right) = -7$

$-\frac{21}{2} + \frac{14}{2} = 3c$

So $c = \frac{1}{3}\left(\frac{7}{2}\right) = \boxed{\frac{-7}{6} = c}$