ANGLES BETWEEN VECTORS - ANSWERS

Let $\vec{u} = 2\hat{i} + 3\hat{j} + 4\hat{k}$, $\vec{v} = \hat{i} - 5\hat{j} + \hat{k}$, and $\vec{w} = -3\hat{i} - 2\hat{j} - 8\hat{k}$. Find the angles between the following vectors. Give your answers in degrees rounded, if necessary, to the nearest tenth of a degree.

1. $\vec{u}$ and $\vec{v}$

$$\theta = \cos^{-1}\left(\frac{\vec{u}\bullet\vec{v}}{\|\vec{u}\|\|\vec{v}\|}\right) = 108.8°$$

2. $\vec{v}$ and $\vec{w}$

$$\theta = \cos^{-1}\left(\frac{\vec{v}\bullet\vec{w}}{\|\vec{v}\|\|\vec{w}\|}\right) = 91.3°$$

3. $\vec{v}$ and $2\vec{w}$

$$\theta = \cos^{-1}\left(\frac{\vec{v}\bullet 2\vec{w}}{\|\vec{v}\|\|2\vec{w}\|}\right) = 91.3°$$

4. $\vec{w}$ and $-\vec{w}$

$$\theta = \cos^{-1}\left(\frac{\vec{w}\bullet(-\vec{w})}{\|\vec{w}\|\|-\vec{w}\|}\right) = 180°$$

5. $(\vec{u} + \vec{w})$ and $(\vec{u} - \vec{w})$

$$\theta = \cos^{-1}\left(\frac{(\vec{u} + \vec{w})\bullet(\vec{u} - \vec{w})}{\|(\vec{u} + \vec{w})\|\|(\vec{u} - \vec{w})\|}\right) = 144.3°$$