

Q1

Thursday, October 29, 2020 8:31 AM

$$a) \quad \vec{v} = \begin{bmatrix} 3 \\ -2 \\ -1 \end{bmatrix}, \quad \vec{w} = \begin{bmatrix} -2 \\ +3 \\ -1 \end{bmatrix}$$

$$c\vec{v} + d\vec{w} = \begin{bmatrix} 3c - 2d \\ -2c + 3d \\ -1c - 1d \end{bmatrix}$$

$$\begin{aligned} & (3c - 2d) + (-2c + 3d) + (-c - d) \\ &= 3c - 2d - 2c + 3d - c - d \\ &= 0 + 0 = \boxed{0} \quad \text{Sum to 0 always} \end{aligned}$$

$$b) \quad c\vec{v} + d\vec{w} = \begin{bmatrix} 2 \\ -6 \\ 4 \end{bmatrix}$$

$$\therefore \begin{bmatrix} 3c \\ -2c \\ -1c \end{bmatrix} + \begin{bmatrix} -2d \\ 3d \\ -d \end{bmatrix} = \begin{bmatrix} 2 \\ -6 \\ 4 \end{bmatrix}$$

$$\begin{aligned} 3c - 2d &= 2 \\ -c - d &= 4 \\ -d &= 4 + c \\ -2d &= 8 + 2c \end{aligned} \quad \rightarrow \quad \begin{aligned} 3c + 8 + 2c &= 2 \\ 5c &= -6 \\ \boxed{c} &= -6/5 \\ -d &= \frac{10 - 6}{5} \end{aligned}$$

$$-d = \frac{14}{5}, \quad \boxed{d = -\frac{14}{5}}$$

$$\begin{aligned} \text{check: } -2c + 3d &= -6 \\ \therefore +2 \cdot \frac{6}{5} - 3 \cdot \frac{14}{5} &= -6 \end{aligned}$$

$$\begin{array}{r} \textcircled{1} \\ 14 \\ \cdot 3 \\ \hline 42 \end{array}$$

$$\therefore \frac{12 - 42}{5} = -6$$

$$\therefore \frac{-30}{5} = -6 \quad \underline{\underline{\text{check out}}}$$

c) Components don't add to 0, as shown in part A.