Exercise 4:
From $v = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$ and $w = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$, find the components of $3v + w$ and $cv + dw$.

$$v = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$
$$w = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$$

$$\begin{aligned} 3v + w &= 3 * \begin{bmatrix} 2 \\ 1 \end{bmatrix} + \begin{bmatrix} 1 \\ 2 \end{bmatrix} \\ &= \begin{bmatrix} 6 \\ 3 \end{bmatrix} + \begin{bmatrix} 1 \\ 2 \end{bmatrix} \\ &= \begin{bmatrix} 7 \\ 5 \end{bmatrix} \end{aligned}$$

$$\begin{aligned} cv + dw &= c * \begin{bmatrix} 2 \\ 1 \end{bmatrix} + d * \begin{bmatrix} 1 \\ 2 \end{bmatrix} \\ &= \begin{bmatrix} 2c \\ c \end{bmatrix} + \begin{bmatrix} d \\ 2d \end{bmatrix} \\ &= \begin{bmatrix} 2c + d \\ c + 2d \end{bmatrix} \end{aligned}$$

Red dots are random linear combinations of v and w.