Exercise 18

Find all values of x such that $(x, 1, x)$ and $(x, -6, 1)$ are orthogonal.

Solution

For two vectors to be orthogonal, their dot product has to be zero.

$$\begin{aligned}(x, 1, x) \cdot (x, -6, 1) &= 0 \\ (x)(x) + (1)(-6) + (x)(1) &= 0 \\ x^2 + x - 6 &= 0 \\ (x + 3)(x - 2) &= 0\end{aligned}$$

Therefore,

$$x = \{-3, 2\}.$$