



1 Let

$$L = \begin{bmatrix} 1 & 3 \\ 0.7 & 0 \end{bmatrix}$$

be the Leslie matrix for a population with two age groups.

- a) Determine both eigenvalues.
- b) Give a biological interpretation of the largest of the two eigenvalues.
- c) Find the stable age distribution.

2 Let $\mathbf{x} = \begin{bmatrix} 2 \\ -1 \\ 0 \end{bmatrix}$ and $\mathbf{y} = \begin{bmatrix} 1 \\ -3 \\ 2 \end{bmatrix}$.

- a) Find $\mathbf{x} - \mathbf{y}$.
- b) Find $4\mathbf{x} + 2\mathbf{y}$.
- c) Find $-\mathbf{x} + 2\mathbf{y}$.
- d) Find the length of $\mathbf{x}$.

3 Let $A = (2, 1)$ and $B = (3, -1)$. Find the vector representation of $B - A$ (same as $\overrightarrow{AB}$). Then sketch A, B and $B - A$.

4 Find the dot product of $\mathbf{x} = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ and $\mathbf{y} = \begin{bmatrix} 3 \\ 5 \\ -2 \end{bmatrix}$.

5 Let $\mathbf{x} = \begin{bmatrix} 1 \\ -2 \\ 0 \end{bmatrix}$. Find a $\mathbf{y}$ such that $\mathbf{x}$ and $\mathbf{y}$ are perpendicular.

6 A triangle has vertices at coordinates $P = (0, 0)$, $Q = (2, 0)$ and $R = (1, 1)$.

- a) Find the lengths of all three sides.
- b) Use the dot product to find all three angles.

- 7 Find a representation of the line through the two points $(2, 1)$ and $(1, 0)$.