Matrices acting on position vectors

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Find the image of $(2, -1)$ under $\begin{pmatrix} 1 & 3 \\ 2 & 0 \end{pmatrix}$. [2 marks]

Multiply row by column to get $(2-3, 4+0)$.

Answer: $(-1, 4)$.

2. Write the matrix sending e_1 to $(2, 0)$ and e_2 to $(0, -1)$. [2 marks]

Use the images as columns.

Answer: $\begin{pmatrix} 2 & 0 \\ 0 & -1 \end{pmatrix}$.

3. Apply $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ to $(3, 2)$. [2 marks]

The rule sends (x, y) to $(-y, x)$.

Answer: $(-2, 3)$.

4. Apply $\begin{pmatrix} 2 & 1 \\ 0 & 1 \end{pmatrix}$ to the vertices $(0, 0), (1, 0), (0, 2)$. [2 marks]

Apply the same rule to every vertex.

Answer: $(0, 0), (2, 0), (2, 2)$.

5. Find the matrix for $(x, y) \mapsto (x - 2y, 3x + y)$. [2 marks]

Coefficients of x give column 1; coefficients of y give column 2.

Answer: $\begin{pmatrix} 1 & -2 \\ 3 & 1 \end{pmatrix}$.

6. A map sends e_1 to (a, b) and e_2 to (c, d). Find the image of $(3, -2)$. [2 marks]

Use three times the first image minus twice the second.

Answer: $(3a - 2c, 3b - 2d)$.