Projections onto coordinate axes

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Give the matrix for projection onto the y-axis. [2 marks]

The unit-vector images are $(0, 0)$ and $(0, 1)$.

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

2. Find $P_x(-5, 6)^T$. [2 marks]

Keep x and remove y.

Answer: $(-5, 0)^T$.

3. Find all points whose x-axis projection is $(2, 0)$. [2 marks]

The x-coordinate must be 2; the y-coordinate is unrestricted.

Answer: $(2, t)$ for any real t.

4. Calculate P_y^2. [2 marks]

Multiply the two diagonal projection matrices.

The surviving diagonal entry remains 1.

Answer: P_y.

5. Explain why a coordinate projection has no inverse. [2 marks]

Many inputs have the same image, and the determinant is zero.

Answer: It loses one coordinate.

6. Compare the x-axis projection and x-axis reflection of $(3, 4)$. [2 marks]

Projection discards y; reflection reverses y.

Answer: Projection $(3, 0)$; reflection $(3, -4)$.