# 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 $(3, -4)$.