Matrices

Pre-Calculus · 6 questions · step-by-step answers at the end

Name: Date: Score: / 6

USEFUL EQUATIONS

$\det [[a, b], [c, d]] = ad - bc$ $A^{-1} = (1/\det)\,[[d, -b], [-c, a]]$ $AX = B \Rightarrow X = A^{-1}B$

$AB \neq BA$ in general

Questions

Show your working in the space under each question.

1. EASY Work out $3 \times [[2, -1], [0, 4]]$.

2. EASY Find the determinant of $[[4, 3], [2, 5]]$.

3. MEDIUM Work out $[[2, 1], [0, 3]]$ times the column vector $(4, -1)$.

4. MEDIUM $A = [[1, 1], [0, 1]]$ and $B = [[1, 0], [1, 1]]$. Find AB and BA.

5. HARD Find the inverse of [[3, 2], [1, 1]].

6. HARD The matrix [[0, −1], [1, 0]] is applied to the point (3, 1). Find the image and describe the transformation.

Step-by-step answers

Matrices

1. Multiply every entry by 3: **[[6, −3], [0, 12]]**.
2. $4 \times 5 - 3 \times 2 = \mathbf{14}$.
3. Top: $2 \times 4 + 1 \times (-1) = 7$. Bottom: $0 + 3 \times (-1) = -3$. **(7, −3)**.
4. AB = **[[2, 1], [1, 1]]** and BA = **[[1, 1], [1, 2]]**. They are different.
5. det = 3 − 2 = 1, so the inverse is **[[1, −2], [−1, 3]]**.
6. Image: $(0 \times 3 - 1 \times 1, 1 \times 3 + 0) = \mathbf{(-1, 3)}$. This is a **rotation of 90° anticlockwise about the origin**; the determinant is 1, so areas are unchanged.