Test - Matrices and determinants

Year: University Year 1 · Duration: 60 minutes · /20

Name:	Date:	**Mark: /20**

Question	1	2	3	4	5	Total
marks	4	4	4	4	4	**20**
Mark						

Show your working.

Question 1 (4 marks)

Question 1 – Products and transposes

Let $P = \begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix}$ and $Q = \begin{pmatrix} 1 & 4 \\ 2 & 0 \end{pmatrix}$.

a. Find PQ and QP. (2 marks)
b. Find $(PQ)^T$. (1 mark)
c. Find $\det(PQ)$ and check that it equals $\det P \det Q$. (1 mark)

Question 2 (4 marks)

Question 2 – A 3 by 3 determinant

Find the determinant of  and state whether the matrix is invertible. Show your method.

Question 3 (4 marks)

Question 3 – Inverse and equations

Let $A = \begin{pmatrix} 4 & 3 \\ 3 & 2 \end{pmatrix}$.

a. Find A^{-1}. (2 marks)
b. Use it to solve $4x + 3y = 1$ and $3x + 2y = 1$. (2 marks)

Question 4 (4 marks)

Question 4 – Problem: ticket prices

At a concert, 2 adult tickets and 3 child tickets cost £62, and 3 adult tickets and 2 child

tickets cost £68.

a. Write the information as a matrix equation. (1 mark)
b. Use Cramer's rule to find the price of each ticket. (3 marks)

Question 5 (4 marks)

Question 5 – Singular matrices

Let $M = \begin{pmatrix} 1 & k \\ 2 & 6 \end{pmatrix}$.

a. Find the value of k for which M is singular. (2 marks)
b. For that k, say whether the system $x + ky = 3$, $2x + 6y = 6$ has no solution or infinitely many. Justify. (2 marks)