

Linear Algebra: Assessed Questions 3

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1 Assessed questions

A total of 10 marks is available.

Exercise 1.1. Find the determinant and inverse of

5 marks

$$M = \begin{pmatrix} 1 & 0 & 0 & 0 \\ -1 & 2 & 1 & 0 \\ 0 & 0 & 3 & -1 \\ 0 & 0 & 0 & 4 \end{pmatrix}.$$

Exercise 1.2. True or false? Justify your answers.

(a) If A is a reflection matrix then $A^{-1} = A$.

1 marks

(b) If B is an orthogonal matrix then the reduced echelon form of B is the identity matrix.

1 marks

(c) There exists a constant c such that the matrix $\begin{pmatrix} c & c & c \\ 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$ is invertible.

1 marks

Exercise 1.3. Let

$$X = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 8 & 2 & 0 & 0 & 0 \\ -9 & 13 & -1 & 0 & 0 \\ 172 & 39 & 332 & 1/2 & 0 \\ -164 & 34/5 & -2 & 9 & 1 \end{pmatrix}.$$

Explaining your answer, and without doing any massive calculations, find the determinant of

2 marks

$$X^6 X^T X(-X).$$