MEMORIAL UNIVERSITY OF NEWFOUNDLAND
DEPARTMENT OF MATHEMATICS AND STATISTICS

MATH2050 Assignment 8

Due: Wednesday 22 November

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[10] 1. For each of the following matrices,

i. find the matrix M of minors, the matrix C of cofactors, the adjoint adj$A$, and compute $(\text{adj}A)A$ and $A(\text{adj}A)$.

ii. find det$A$.

iii. find A^{-1} or state why it doesn't exist.

(a) $A = \begin{bmatrix} 4 & 7 \\ 8 & 14 \end{bmatrix}$ (b) $A = \begin{bmatrix} 3 & 5 & 2 \\ 4 & 8 & 9 \\ -1 & 2 & 5 \end{bmatrix}$

[6] 2. Use a Laplace expansion to find the determinant of each of the following matrices.

$$A = \begin{bmatrix} 4 & 3 & 1 \\ 0 & 2 & 1 \\ 3 & 5 & 2 \end{bmatrix}. \qquad B = \begin{bmatrix} 1 & 0 & 2 & 3 \\ 1 & 2 & 0 & 1 \\ -1 & 2 & 1 & 0 \\ 0 & 1 & 1 & 1 \end{bmatrix}$$

[6] 3. Are the following sets of vectors linearly independent or not?

(a) $\vec{a_1} = \begin{bmatrix} 4 \\ 0 \\ 3 \end{bmatrix}, \vec{a_2} = \begin{bmatrix} 3 \\ 2 \\ 5 \end{bmatrix}$ and $\vec{a_3} = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}$.

(b) $\vec{b_1} = \begin{bmatrix} 0 \\ 2 \\ 2 \\ 1 \end{bmatrix}, \vec{b_2} = \begin{bmatrix} 2 \\ 0 \\ 1 \\ 1 \end{bmatrix}, \vec{b_3} = \begin{bmatrix} 1 \\ 1 \\ -1 \\ 0 \end{bmatrix}$ and $\vec{b_4} = \begin{bmatrix} 3 \\ 1 \\ 0 \\ 1 \end{bmatrix}$.

[6] 4. Let A and B be are 4×4 invertible matrices such that det$A = -2$ and det$B = 5$. Find the following determinants

(a) $\det A^{-1}$

(b) $\det \frac{1}{3} A$

(c) $\det A^{-1} B^T A^2 (2B)$.

[4] 5. Suppose $\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix} = 5$. Find $\begin{vmatrix} 2p & 7a & a-x \\ 2q & 7b & b-y \\ 2r & 7c & c-z \end{vmatrix}$.

[8] 6. Without using the fact that $\det(AB) = (\det A)(\det B)$, show that $\det(EA) = (\det E)(\det A)$ for any $n \times n$ matrix A and elementary matrix E. (Consider separately the cases when A is singular and invertible).

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