Practice Midterm 2

MAT 310

Nov 11, 2014

Name: **ID #**:

(please print)

Your recitation: Mon Tu (please circle)

No books or notes; calculators are allowed. Please show your work and **provide full solutions**, with your reasoning, not just answers. Solutions must be readable; the grader should be able to follow your arguments. Cross out anything the grader should ignore: everything not crossed out will be considered to be part of your solution.

	1	2	3	4	**Total**
Grade					

(1) Compute the determinant of

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 0 & 0 & 9 & 10 \\ 0 & 0 & 11 & 12 \end{bmatrix}$$

(2) Determine the values of a for which the system .

$$x_1 + 2\,x_2 - x_3 + x_4 = 5$$
$$x_1 + x_2 - 2\,x_3 + 3\,x_4 = 6$$
$$-2\,x_1 + 6\,x_3 - 10\,x_4 = a$$

is consistent. Find the basis in the space of solution for such a.

(3) Let A be an $m \times n$ matrix and B, an $n \times m$ matrix $(m > n)$. Prove that $\det(AB) = 0$.

(4) Find the eigenvalues of the matrix A, given below. Find bases for the eigenspaces of A. Can you find an invertible matrix, S, such that $S^{-1}AS = D$, where D is a diagonal matrix? If no, why not? If yes, find the matrices S and D.

(a)

$$A = \begin{bmatrix} 3 & 2 & -2 \\ 2 & 3 & -2 \\ 6 & 6 & -5 \end{bmatrix}$$

(b)

$$A = \begin{bmatrix} -8 & 5 & 4 \\ -9 & 5 & 5 \\ 0 & 1 & 0 \end{bmatrix}$$

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