Practice Exam 2

Math 309 Fall 2016

November 9, 2016

You may use a scientific calculator, but no notes, graphing calculators, or other electronic devices allowed.

Fill out your scantron cards with your name, *including your official "preferred" name*, and your ID number.

Part I: Multiple Choice (30) Each problem in this section is worth five points.

1. A linear transformation $T : \mathbb{R}^2 \to \mathbb{R}^2$ is given by $T(\mathbf{x}) = A\mathbf{x}$ for a certain matrix A. If S a two by three rectangle, the image under the transformation $T(S)$ is a parallelogram with area 36. Which of the following matrices might be A?

A) $\begin{bmatrix} 17 & 31 \\ -12 & 22 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 3 \\ -1 & 2 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 1 \\ 0 & 2 \end{bmatrix}$ D) $\begin{bmatrix} 2 & 0 \\ -12 & -3 \end{bmatrix}$

E) $\begin{bmatrix} 7 & 3 \\ -3 & 0 \end{bmatrix}$ F) $\begin{bmatrix} 6 & 0 \\ -1 & 6 \end{bmatrix}$ G) $\begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$ H) $\begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$

Area(S) = 6, Area(T(S)) = 36, need $\det A = \pm 6$

2. Find all x such that $\det \begin{bmatrix} 0 & 0 & 2x \\ 10 & x & -4 \\ -3 & 0 & 36 \end{bmatrix} = \det \begin{bmatrix} x & -2 & 11 \\ 0 & 5 & -2 \\ 0 & -4 & 4 \end{bmatrix}$

A) all real numbers x B) no real numbers x C) 0, -2 D) 0, 2
E) 6, 12 F) 0, 6 G) -2, 6 H) none of the above

$2x(0-(-2x)) = x\cdot(20-8) \Rightarrow 6x^2 = 12x$
$6x(x-2) = 0$

3. Let A be an $m \times n$ matrix and suppose the reduced echelon form of A has two rows of zeros. What is the dimension of Nul(A)?

A) m B) n C) n - m D) n - m + 2 E) m - n + 2
F) m + n G) m + n +2 H) none of the above

rank + nullity = n
m - 2 + dim Nul A = n
dim Nul A = n - (m-2)