

Math 208, Midterm 2

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Student ID #: \_\_\_\_\_

Section #: I

- You are allowed a Ti-30x IIS Calculator and one  $8.5 \times 11$  inch paper with handwritten notes on both sides. Other calculators, electronic devices (e.g. cell phones, laptops, etc.), notes, and books are **not** allowed.
- Some questions require you to explain answers: no explanation, no credit.
- Try to show your work on all questions: no work, no partial credit.
- You may use the back of the exam for scratch work: please submit any additional paper you use.
- Place 

a box around your answer
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 to each question.
- Raise your hand if you have a question.

1	/10
2	/10
3	/10
4	/10
5	/10
T	/50

Good Luck!

2

- (1) Determine bases for the row space (3pts), nullspace (3pts), and column space (3pts) of  $A = \begin{pmatrix} 2 & 3 & 5 \\ 8 & 13 & -4 \end{pmatrix}$ .

(1pt) What is the rank of  $A$ ?

- (2) Consider the matrix  $A = \begin{pmatrix} \sqrt{2}/2 & 0 & -\sqrt{2}/2 \\ 3 & 1 & 1 \\ \sqrt{2}/2 & 0 & \sqrt{2}/2 \end{pmatrix}$ .
- (a) (5pts) Calculate  $\det(A)$

- (b) (5pts) Determine whether or not  $A^{-1}$  exists, and if so compute it.

(3) Consider the matrix

$$R = \frac{1}{3} \begin{pmatrix} 1 & 2 & 2 \\ 2 & -2 & 1 \\ 2 & 1 & -2 \end{pmatrix}$$

(a) (5pts) Calculate the matrix product  $R^T R$ .

(b) (5pts) What is the general solution to the following  $3 \times 3$  linear system?

$$R \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

- (4) (10pts) Let  $R$  be the matrix from the Problem 3. Find a *nonzero* vector  $v \in \mathbb{R}^3$  such that  $Rv = v$ .

- (5) Let  $X = \{(x, y) \in \mathbb{R}^2 \mid y = |x| \text{ and } x \geq 0\}$  (here  $|\bullet|$  denotes the usual absolute value of a real number  $\bullet$ .)
- a) (5pts) Is  $X$  a subspace of  $\mathbb{R}^2$ ? Explain.

- b) (5pts) What is the smallest subspace of  $\mathbb{R}^2$  containing  $X$ ?