

Name:

Directions: Show all work and clearly mark your final answers. All your work should be on these exam pages (do not use scrap paper). You may use a calculator, but you should indicate where you used a calculator to do complicated calculations. The time limit is 50 minutes.

1. (10 pts) Find an equation of the line passing through the points $(-2, -1)$ and $(-8, 3)$.

2. The average score on a college entrance exam (out of a possible 100 points) given annually to incoming freshmen is recorded each year, and the results are as follows:

Year:	1994	1996	1998	2000	2002	2004	2006
Avg score:	85.2	83.6	81.7	82.5	82.0	80.1	80.3

- (a) (6 pts) Find the least-squares line for this data and use the equation of this least-squares line to predict the average score for incoming freshmen in the year 2010.

- (b) (4 pts) Does the least-squares line you found in part (a) accurately represent the data? Why or why not?

3. Suppose A is a matrix with 4 rows and 3 columns, B is a matrix with 4 rows and 4 columns, and C is a matrix with 3 rows and 3 columns. (Note: for a matrix M , M^2 means M times M , just like with numbers.)
- (a) (5 pts) Is B^2AC defined? If so, how many rows and columns does it have? If not, why not?
- (b) (5 pts) Is BA^2C defined? If so, how many rows and columns does it have? If not, why not?
4. Suppose you are given a linear system of 5 equations in 7 variables.
- (a) (3 pts) How many rows does the augmented matrix corresponding to this system have?
- (b) (3 pts) How many columns does the augmented matrix corresponding to this system have?
- (c) (8 pts) Explain why it is impossible for this system to have exactly one solution.

5. For the following systems of equations, give the number of solutions to the system and if the system has at least one solution, describe all solutions to the system.

(a) (8 pts)
$$\begin{cases} -20x + 15y = 10 \\ 36x - 27y = -18 \end{cases}$$

(b) (8 pts)
$$\begin{cases} 5x - 7y - 3z = 5 \\ x + 3y + 5z = 6 \\ -x + 3y - z = -1 \end{cases}$$

$$(c) \text{ (8 pts)} \begin{cases} 2x - y + 3z = 8 \\ 3x + 2y - 2z = -3 \\ 13x + 4y = 5 \end{cases}$$

6. (12 pts) Suppose you are a ticket broker and you are trying to acquire tickets to the Final Four basketball tournament. There are four kinds of tickets available: lower-level (which cost \$400 each), mezzanine (which cost \$350 each), upper-level (which cost \$250 each), and distant view (which cost \$175 each). Suppose you want to acquire 800 tickets and have \$180,000 to spend, and that you want to buy as many twice as many lower-level tickets as mezzanine tickets. Set up a linear system of equations which can be solved to find out how many of each ticket you should buy (be sure to carefully define your variables). You do not need to solve the system.

7. Suppose the payoff matrix for some game is $\begin{pmatrix} 3 & 3 & 0 & 1 \\ -4 & 5 & 0 & 2 \\ 1 & -2 & -3 & 0 \end{pmatrix}$.

(a) (10 pts) If player A chooses row 1 with probability .4 and chooses row 3 with probability .6, and if player B chooses all columns equally often, how much would you expect player A to win or lose after the players play 500 times?

(b) (10 pts) If the players use *optimum* strategy, how much will player A win or lose after the players play 500 times?