Accelerated Precalculus
Solving Systems of Equations

Unit 1 Matrices
Name: Key

Directions: Choose 3 problems from each section to solve.

A. Find the equation of the graph described in each question.

1. Consider the following graph. The parabola passes through the points (-1, 2), (0, -2), and (1, 0). Write a system of equations for this graph. Solve the system and write an equation for the parabola. Recall that y = ax²+bx+c is the standard equation of a parabola.

$y = 3x^2 - x - 2$

2. A videotape of the path of a ball thrown by a baseball player was analyzed with a grid covering the TV screen. The tape was paused three times, and the position of the ball was measured each time. The coordinates obtained are shown in the table (x and y are measured in feet).

$y = -\frac{1}{250}x^2 + \frac{11}{30}x + 5$

Horizontal distance, x	Height, y
0	5.0
15	9.6
30	12.4

Use a system of equations to find the equation of the parabola that passes through the points. Solve the system and approximate the maximum height of the ball and the point at which the ball strikes the ground.

3. Given $f(x) = ax^3 + bx^2 + cx + d$, determine f so that its graph contains the points (-2, -37), (-1, -11), (0, -5), (2, 19)

$y = 3x^3 - x^2 + 2x - 5$

4. The table shows the average price y (in dollars) of shares traded on the New York Stock Exchange from 1999 to 2001.

Year	Average Price, y
1999	43.90
2000	42.10
2001	34.10

$y = -3.1x^2 + 57.1x - 218.9$

2002: $t = 12$, $y = \$19.90$

Use a system of equations to find the equation of the parabola that passes through the points given. Let t = 9 represent 1999. Solve the system using matrices. Use the equation to estimate the average price of shares traded in 2002.

B. Define each variable you use. Write a system of equations to represent the situation described. Solve each system using matrices. Answer in a full sentence!

1. The University of Georgia and Florida State University scored a total of 39 points during the 2003 Sugar Bowl. The points came from a total of 11 different scoring plays, which were a combination of touchdowns, extra-point kicks, and field goals, worth 6, 1 and 3 points respectively. The same numbers of touchdowns and field goals were scored. How many touchdowns, extra-point kicks, and field goals were scored during the game?

TD: 4
EP: 3
FG: 4

2. A Watusi, a Ubangi, and a Pigmy compare the speeds at which each can run. The sum of the speeds of the natives is 30 miles per hour. The Pigmy's speed plus one third of the Watusi's speed is 22 miles per hour more than the Ubangi's speed. Four times the Watusi's speed plus three times the Ubangi's speed minus twice the Pigmy's speed is 12 miles per hour. Determine how fast each native can run. What is unfortunate about the Ubangi?

W: 12
U: 0
P: 18

3. A small corporation borrowed $1,500,000 to expand its line of shoes. Some of the money was borrowed at 7%, some at 8%, and some at 10%. Use a system of equations and matrices to determine how much was borrowed at each rate if the annual interest was $130,500, and the amount borrowed at 10% was four times the amount borrowed at 7%.

$z = 4x$

x = 7% = 150000
y = 8% = 750000
z = 10% = 600000

n = 22
d = 35
q = 17

4. Matthew has 74 coins consisting of nickels, dimes, and quarters in his coin box. The total value of the coins is $8.85. If the number of nickels and quarters is four more than the number of dimes, find how many of each coin Matthew has in his coin box.

x = $1 = 27
y = $5 = 18
z = $10 = 6

5. Heather has saved $177 to take with her on vacation. She has 51 bills consisting of $1, $5, and $10 bills. If the number of $5 is three times the number of $10 bills, find out how many of each bill she has.

C. Define each variable you use to solve the following mixture problems.

1. Aileen's drugstore needs to prepare a 60-L mixture that is 40% acid using three concentrations of acid. The first concentration is 15% acid, the second is 35% acid, and the third is 55% acid. Because of the amounts of acid solution on hand, they need to use twice as much of the 35% solution as the 55% solution. How much of each solution should they use? Use the following questions to help you:
   a. Let x = the number of liters of 15% solution use, y = the numbers of liters of 35% solution used, and z = the number of liters of 55% solution used.
   b. Explain how the equation $x + y + z = 60$ is related to the problem.
   c. Explain how the equation $0.15x + 0.35y + 0.55z = 24$ is related to the problem. $60(.40) = 24$
   d. Explain how the equation is $y = 2z$ is related to the problem.
   e. Solve the system of three equations from above using matrices.
   f. Interpret the solution in terms of the problem situation.

15% = 3.75 {15/4
35% = 37.5 {75/2
55% = 18.75} 75/4

22% = 14.54
30% = 29.09
42% = 36.36

2. Stewart's Metals has three silver alloys on hand. One is 22% silver, another is 30% silver, and the third is 42% silver. How many grams of each alloy is required to produce 80 grams of a new alloy that is 34% silver if the amount of 30% alloy used is twice the amount of the 22% alloy used.

3. Simpson's Drugstore needs to prepare a 40-L mixture that is 32% acid from three solutions: a 10% acid solution, a 25% acid solution, and a 50% acid solution. How much of each solution should be used if Simpson's wants to use as little of the 50% solution as possible?

X = 4
Y = 18
Z = 8

4. A mixture of 12 liters of chemical A, 16 liters of chemical B, and 26 liters of chemical C is required to kill a destructive crop insect. Commercial spray X contains 1, 2, and 2 parts, respectively, of these chemicals. Commercial spray Y contains only chemical C. Commercial spray Z contains only chemicals A and B in equal amounts. How much of each type of commercial spray is needed to obtain the desired mixture?

5. A grocer wants to mix three kinds of hard candy to sell for $2.40/lb. He needs 50 pounds of candy altogether. He mixes sourballs worth $3.50/lb, butterballs worth $2.50/lb, and starlight mints worth $1.75/lb. He mixes twice as many butterballs as sourballs. Find the number of pounds of each kind of candy he mixes together.

Sour = 10
butter = 20
mints = 20