Math 141 Week in Review
Week 11 Problem Set

Note: This review does not cover every concept that could be tested on a final. Please also look at previous Week in Reviews for more practice problems. Every instructor writes his or her own final, so you should also review your old tests, quizzes, assignments, and class notes.

1. Determine whether the following matrices are regular.

A. $\begin{bmatrix} 0.7 & 0.2 & 0.5 \\ 0.2 & 0.6 & 0.3 \\ 0.1 & 0.2 & 0.4 \end{bmatrix}$ **B.** $\begin{bmatrix} 0.8 & 1 & 0.4 \\ 0.1 & 0 & 0.3 \\ 0.1 & 0 & 0.3 \end{bmatrix}$ **C.** $\begin{bmatrix} 1 & 0.2 & 0.5 \\ 0 & 0.6 & 0.3 \\ 0 & 0.2 & 0.2 \end{bmatrix}$

2. Suppose that in a study of Coke and Pepsi, it was found that currently, 75% of people drink Coke and 25% drink Pepsi. Every year, 72% of those who drink Coke will continue to do so and the rest will switch to Pepsi. Furthermore, 54% of those who drink Pepsi will continue to do so and the rest will switch to Coke.

A. What percentage of people will drink Coke and Pepsi after 2 years?
B. In the long run, what percentage of people will drink Coke and Pepsi?

3. A guitar manufacturer determines that when the price of a guitar is \$150, the quantity demanded is 1200. When the price is \$225, the quantity demanded decreases by 100. The supplier is not willing to supply any guitars at a price of \$100, but will supply 300 guitars at a price of \$175. What is the market equilibrium for this guitar manufacturer?

4. Use Gauss-Jordan Elimination to put the following matrix in row-reduced form.

$$\left[\begin{array}{cc|c} 2 & -4 & 10 \\ 6 & 3 & -15 \end{array}\right]$$

5. Solve the following systems of equations.

A. $\begin{aligned} x - y + z &= 16 \\ -2x + y + z &= -5 \\ 3x + 2y - z &= 1 \end{aligned}$ **B.** $\begin{aligned} 2x + 4y - 6z &= 8 \\ -3x - 6y + 9z &= 7 \\ x + 2y - 3z &= 5 \end{aligned}$ **C.** $\begin{aligned} 5x + y - 2z &= -13 \\ 3x - 6y + 3z &= -18 \\ -2x + 4y - 2z &= 12 \end{aligned}$

6. Solve the following matrix equation for the variables *a*, *b*, *c*, and *d*.

$$\begin{bmatrix} 2 & a \\ 3 & b \end{bmatrix}^T + \begin{bmatrix} 1 & -2 & c \\ 0 & 5 & 8 \end{bmatrix} \begin{bmatrix} 6 & d \\ -4 & 1 \\ -1 & 0 \end{bmatrix} = -2 \begin{bmatrix} -6 & -5 \\ 1 & 4 \end{bmatrix}$$

7. You are buying a house for $189,000. You make a down payment of $12,000 and secures a 25-year loan at an interest rate of 6% per year compounded monthly for the remaining balance.

A. What is the required monthly payment?
B. How much total interest will you pay?
C. You decide to refinance the loan after 9 years. The new loan is for 15 years at an interest rate of 5% per year compounded monthly. What is the new monthly payment?

8. A quiz has a total of 10 questions on it: 5 true/false and 5 multiple choice. The professor is very generous and says that students only have to answer 7 of the 10 questions, of which 3 must be true/false and 4 must be multiple choice. Each multiple-choice problem has 5 possible answers. How many ways are there to complete the test if a student answers exactly 3 true/false and exactly 4 multiple choice?

9. A potter makes only vases and mugs. Each vase requires 6 pieces of clay and takes 8 hours to make. Each mug requires 4 pieces of clay and takes 2 hours to make. The potter makes a profit of $12 on each vase and $3 on each mug. He knows that the number of mugs made should be at most twice the number of vases made. The potter only has available 42 pieces of clay each week, but wants to work at least 24 hours each week. How many vases and mugs should the potter make each week in order to maximize profit? Minimize profit? Are there any leftover resources?

10. A survey of 300 A&M students was done asking what video game systems (Atari, Nintendo, Playstation) they had growing up. Let A be the set of students who had an Atari, N be the set of students who had a Nintendo, and P be the set of students who had a Playstation. The following data was found.
45 students only had Nintendo.
156 students had a Playstation.
73 students had all 3 systems.
11 students had an Atari and a Playstation but not a Nintendo.
115 students had a Nintendo and a Playstation.
100 students had exactly one of these systems.
101 students had a Nintendo or an Atari, but not a Playstation.

A. How many students had none of these game systems?
B. How many students had an Atari?
C. What is $n((N \cap A) \cup (P \cap N^C))$?
D. What is the probability that a student in this group had exactly 2 of these systems?

11. A bag contains 9 Skittles and 10 M&M's. There are 3 red Skittles, 4 yellow Skittles, and 2 green Skittles. There are 2 red M&M's, 5 yellow M&M's, and 3 green M&M. An experiment consists of reaching into the bag and pulling out a piece of candy.

A. What is the probability that the chosen piece is green or a Skittle?
B. What is the probability that a yellow piece is not chosen?
C. Let E be the event that a red candy is drawn. Let F be the event that an M&M is drawn. Are E and F mutually exclusive? Are E and F independent?

12. Data is given below relating the quiz averages and final exam scores of 10 students in a Math 141 class. Find the least-squares line for this data and use it to predict the final exam score of a student in this class who has a quiz average of 70.

Quiz Average, *x*	43	54	62	69	74	77	81	88	94	98
Final Exam Score, *y*	37	55	65	67	78	80	80	85	85	99

13. A bag of Hershey's miniatures contains 10 milk chocolates, 9 Mr. Goodbar's, 7 Krackels, and 8 dark chocolates. A sample of 8 chocolates is taken from the bag. What is the probability that the sample contains

A. exactly 3 milk chocolates or exactly 4 dark chocolates?
B. at least 1 Krackel?

14. In a group of students, it is known that 21% live in the dorms. Further, 67% of those who live in the dorms are freshmen whereas 39% of those who do not live in the dorms are freshmen. What is the probability that a student in this group who is not a freshman lives in the dorms?

15. A simple game consists of rolling a pair of dice. The game costs \$2 to play. If a double is rolled, you win \$4. If the sum of the dice is 9, you win \$7. If exactly one two is rolled, you win \$1. Otherwise, you win nothing. Let X be the net winnings of a person who plays this game. Find the expected value, standard deviation, and variance of X.

16. A simple economy consists of 2 sectors: food and shelter. The production of 1 unit of food requires the consumption of .4 units of food and .2 units of shelter. The production of 1 unit of shelter requires the consumption of .3 units of food and .2 units of shelter. Find the gross output of goods needed to satisfy a consumer demand of 12,285 units of food and 3,185 units of shelter.

17. It is found that 31% of batteries last for more than 5 hours. If a factory produces 400 batteries, what is the probability that at least 150 of them will last for more than 5 hours?

18. A calendar company incurs monthly costs of \$3300 in rent and utilities. Each calendar costs the company \$8 to make and is sold for \$14. What is the break-even quantity for this company?

19. Suppose that in 1995, the probability a family had a computer in the United States was 0.54. Use an appropriate normal distribution to approximate the binomial probability that, in a group of 650 families, at least 375 of them had a computer?

20. Suppose you have 16 DVDs of which 5 are comedies, 6 are dramas, and 5 are action movies. Your DVD case only holds 9 DVDs and you want 3 comedies, 4 dramas, and 2 action movies in the DVD case. How many ways are there to arrange 9 DVDs in the DVD case if you want the comedies together, the dramas together, and the action movies together?

21. Find the value of z that satisfies $P(-z < Z < z) = 0.5834$.

22. You need $7000 to go on a tour of Europe. If you deposit $400 every quarter in a savings account that earns interest at a rate of 9% per year compounded quarterly, how long will it take for you to accrue the total amount? How much of the total is interest?

23. Let $U = \{1, 2, 3, 4, 5, 6\}$, $A = \{1, 3, 5\}$, $B = \{2, 3, 4\}$, and $C = \{2, 4, 5\}$. Find the following sets.

A. $A^{C} \cap B$
B. $(B \cup C)^{C}$
C. $B \cup (A \cap C)^{C}$

24. Find the equation of the line passing through the x-intercept of the line $2x - 6y = 18$ and perpendicular to the line through the points $(1, 5)$ and $(3, -4)$.

25. Suppose the weights of elephants are normally distributed with a mean of 14000 pounds and a standard deviation of 3000 pounds. What is the probability that an elephant selected at random weighs more than 16500 pounds?