

Math 141 Final Exam Review Problem Set

Note: This review does not cover every concept that could be tested on a final. Please also take a look at previous Week in Reviews for more practice problems. Every instructor makes up their own final, so it would be beneficial for you to also look over your old tests, quizzes, assignments, and class notes.

1. Determine whether the following matrices are regular.

(a) $\begin{bmatrix} .7 & .2 & .5 \\ .2 & .6 & .3 \\ .1 & .2 & .4 \end{bmatrix}$

(b) $\begin{bmatrix} .8 & 1 & .4 \\ .1 & 0 & .3 \\ .1 & 0 & .3 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & .2 & .5 \\ 0 & .6 & .3 \\ 0 & .2 & .2 \end{bmatrix}$

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, while 28% will switch to Pepsi. Further, 54% of those who drink Pepsi will continue to do so, while 46% switch to Coke.

(a) What percentage of drinkers will Coke and Pepsi have after 2 years?

(b) In the long run, what percentage of soda drinkers will Coke and Pepsi have?

3. A guitar manufacturer determines that when the price of a guitar is \$150 that 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 the Gauss-Jordan Elimination Method to get 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.

$$\begin{aligned} \text{(a)} \quad & x - y + z = 16 \\ & -2x + y + z = -5 \\ & 3x + 2y - z = 1 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad & 2x + 4y - 6z = 8 \\ & -3x - 6y + 9z = 7 \\ & x + 2y - 3z = 5 \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad & 5x + y - 2z = -13 \\ & 3x - 6y + 3z = -18 \\ & -2x + 4y - 2z = 12 \end{aligned}$$

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

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

9. A potter makes only vases and ash trays. (He's a beginner.) Each vase requires 6 pieces of clay and takes 8 hours to make. Each ash tray 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 ash tray. He knows that the number of ash trays 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 ash trays should the potter make each week in order to maximize profit? Is there any leftover clay at this level of production? What would be the level of production that minimizes profit?

10. A survey of 300 A&M students was done asking what video game systems (Atari, Nintendo, Gameboy) 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 G be the set of students who had a Gameboy. The following data was found.

45 students only had Nintendo.

156 students had a Gameboy.

73 students had all 3 systems.

11 students had an Atari and a Gameboy but not a Nintendo.

115 students had a Nintendo and a Gameboy.

100 students had exactly one of these systems.

101 students had a Nintendo or an Atari, but not a Gameboy.

(a) How many students had none of these game systems?

(b) How many students had an Atari?

(c) What is $n((N \cap A) \cup (G \cap N^c))$?

(d) What is the probability that a student in this group had exactly 2 of these systems?

11. In a bag I have 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, 7 yellow M&M's, and 1 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 yellow or a Skittle?

(b) What is the probability that a green 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.

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

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 70 quiz average.

20. Suppose I have 16 DVDs. 5 are comedies, 6 are dramas, and 5 are action movies. My DVD case only holds 9 DVDs. I know that I want 3 comedies, 4 dramas, and 2 action movies in the DVD case. How many ways are there to arrange 9 DVDs in my DVD case if I want the comedies together, the dramas together, and the action movies together?

21. Find the value of z that satisfies $P(-z < Z < z) = 0.5832$.

22. Benjamin wants to have \$7000 so that he can go on a vacation. If he deposits \$400 every quarter in a savings account that earns interest at a rate of 9%/yr compounded quarterly, how long will it take for him to accrue the desired amount? How much of this 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 that passes through the x -intercept of the line $2x - 6y = 18$ and is perpendicular to the line that passes 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?