



MATH 140: WEEK-IN-REVIEW 3
(2.3, 2.4 & REVIEW QUESTIONS OVER CHAPTERS 1 & 2)

1. Find the exact intersection point of the lines $7x - 11y = 25$ and $-5x + 6y = -16$

2. Given the system

$$\begin{cases} -3x + 4y = 20 \\ kx - 8y = -16 \end{cases}$$

For what value(s) of k is/are there

(a) infinitely many solutions?

(b) no solutions ?

(c) exactly one solution?



3. Solve the following system of equations using the substitution method.

$$\begin{cases} -2x + 3y = -7 \\ 6y - 4x = 16 \end{cases}$$

4. Solve the following system of equations using the addition method.

$$\begin{cases} 3x - 2y = 7 \\ -6x + 4y = -14 \end{cases}$$



5. A company has a profit function $P(x) = 12.5x - 14250$, where x represents the number of gadgets made and sold by the company, and the profit is given in dollars. Suppose that each item is sold for \$30.

(a) Determine the company's cost and revenue functions.

(b) Determine the company's break-even point and explain the meaning of each coordinate of the break-even point in the context of the application.



6. Determine the equilibrium point for a marketplace with demand and supply for x record players (in units of 100) given by $p(x) = -2.5x + 250$ and $p(x) = 3.5x + 40$, respectively, where $p(x)$ is in dollars. Then write a sentence explaining the meaning of the coordinates of the point found, in the context of the application.



7. Given the system of equations below, write the corresponding augmented matrix

$$\begin{cases} 3x + 2y - 4z = 4 \\ 4y + z = 2 + 2x \\ 6z - 1 = 3x - 2y \end{cases}$$

8. What system of linear equations would result in the following augmented matrix? (Assuming variables x , y , and z)

$$\left[\begin{array}{ccc|c} 2 & 0 & -1 & 3 \\ 1 & 4 & 9 & 0 \\ -2 & 1 & 3 & -1 \end{array} \right]$$



9. Perform the given row operations in the Gauss-Jordan Elimination Method, and show the resulting matrices.

$$\begin{bmatrix} 1 & 2 & -3 & | & 11 \\ 0 & 1 & -2 & | & 5 \\ 0 & 0 & 1 & | & -1 \end{bmatrix} \begin{array}{l} -2R_2 + R_1 \rightarrow R_1 \\ \\ -R_3 + R_1 \rightarrow R_1 \\ \\ 2R_3 + R_2 \rightarrow R_2 \end{array} \left[\begin{array}{c} \\ \\ \\ \end{array} \right]$$



10. Determine whether the following matrices are in reduced row echelon form.

If YES, write the final simplified system and state the solution.

If NO, write the next best row operation you would use in the Gauss-Jordan Elimination Method.

$$(a) \left[\begin{array}{cc|c} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right]$$

$$(b) \left[\begin{array}{ccc|c} 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & -4 & 6 \end{array} \right]$$

$$(c) \left[\begin{array}{ccc|c} 1 & 0 & 0 & 5 \\ 0 & 0 & 1 & 6 \\ 0 & 1 & 0 & 7 \end{array} \right]$$

$$(d) \left[\begin{array}{ccc|c} 1 & 3 & 0 & 0 \\ 0 & 1 & 1 & 1 \end{array} \right]$$

$$(e) \left[\begin{array}{ccc|c} 1 & 0 & 3 & 10 \\ 0 & 1 & 5 & 20 \\ 0 & 0 & 0 & 0 \end{array} \right]$$



11. Solve the following system of equations. If there are infinitely many solutions, find both the parametric solution and one specific solution. State whether the system is independent, inconsistent or dependent.

(a)

$$\begin{cases} 3x + 2y - 4z = -3 \\ 4y + z = 5 + 2x \\ 10y - x = 7 + 2z \end{cases}$$

(b)

$$\begin{cases} 3x + 2y - 4z = -3 \\ 4y + z = 5 + 2x \\ 6z - 15 = 3x - 2y \end{cases}$$

(c)

$$\begin{cases} x + z = 4 + 3y \\ 2y - 5z = 3 + x \\ 5x + 13z = 8 + 13y \end{cases}$$



For the next two problems, set up a system of linear equations representing the given problem, then find a solution to the given problem.

12. A private school orders three types of plastic shapes for children: rectangles, squares, and triangles. Suppose the private school wants to have 210 squares, 194 rectangles, and 243 triangles for their math class, and they come in three different types of boxes: small, medium and large boxes. The small box contains 5 triangles, 2 rectangles and 4 squares. The medium box contains 12 rectangles, 14 triangles and 10 squares. The large box contains 20 squares, 18 rectangles and 19 triangles. Assuming that all the required shapes will be packaged without left overs, how many of each type of box will the private school order?



13. A company decides to spend \$5 million on radio, magazine and TV advertising. If the company spends as much money on TV advertising as on radio and magazine together, and the amount spent on magazines and TV combined equals three times that spent on radio, what is the amount to be spent on each type of advertising?



14. If A is a 3×4 matrix, B is a 3×4 matrix, and C is a 4×3 matrix, determine the size of $(3A+4B)^T - 5C$, if possible.

15. Determine the values of w , x , and y given
$$\begin{bmatrix} 2 & w-1 \\ 2 & 4x \end{bmatrix} - \begin{bmatrix} y & -6 \\ -8 & 12 \end{bmatrix}^T = 2 \begin{bmatrix} -1 & 9 \\ 4 & -4 \end{bmatrix}$$

16. If A is a 2×4 matrix, B is a 2×4 matrix, and C is a 3×2 matrix, determine the size of CAB^T , if possible.



17. There are three food trucks in town which sell chicken. Last week, the east store sold 120 chicken fingers, 48 baskets of fries, 60 chicken sandwiches, and 60 cans of soda. The west store sold 105 chicken fingers, 72 baskets of fries, 21 chicken sandwiches, and 147 cans of soda. The north store sold 60 chicken fingers, 40 baskets of fries, 50 cans of soda, but no chicken sandwiches.
- (a) Write down a 4×3 matrix Q to express the sales information for these three food trucks last week.
- (b) Suppose sales at the food trucks are expected to decrease by 18% next week, use a matrix to show the expected sales for next week.
- (c) If each order of chicken fingers costs \$8.99, each basket of fries costs \$4.99, each chicken sandwich costs \$9.45, and a can of soda costs \$1.50, write down a pricing matrix P so that it can be multiplied by the matrix Q above to give last week's total revenue from each of the three stores.



18. Compute $\begin{bmatrix} -2 & 3x & 3 \\ 6w & 0 & 2y \end{bmatrix} \begin{bmatrix} -6 & 3m \\ 3n & 4 \\ -p & 0 \end{bmatrix}$.

19. Write the equation of the line that passes through the point $(-3, 7)$ and has a slope of $-\frac{2}{3}$.



20. You have a line which passes through the points $(3, -4)$ and $\left(\frac{1}{2}, \frac{2}{3}\right)$. If x decreases by 6 units, what is the corresponding change in y ?

21. An automobile purchased for use by the manager of a firm at a price of \$23,950 is to be depreciated using a linear model over ten years. What will the book value of the automobile be at the end of five years if the automobile has a scrap value of \$1,000 at the end of 10 years?



22. Tim sells lemonade at his lemonade stand. He makes the lemonade for \$0.50 per cup. When he sells 20 cups in a day, then his profit is \$15. When he sells 30 cups in a day, then his cost for that day is \$40.

(a) Determine the linear cost function.

(b) Determine the linear revenue function.

(c) Determine the linear profit function.