

Math1090 Midterm 1 Review

Sections 1.1-1.8, 2.1

1. Solve the equation $\frac{x+5}{x+3} = \frac{1}{3} + \frac{x-1}{x+3}$.
2. Solve this inequality and graph the solutions on the real number line
 $3x - 1 \leq -5(2 - x)$
3. For the system of inequalities.

$$\begin{aligned} 2y - x &\leq 4 \\ x + y &\leq 6 \\ y &\geq -1 \end{aligned}$$
 - (a) Graph the solution set and label the corners (vertices).
 - (b) Maximize the objective function $f = 5x - 12y$ with the constraints in (a).
4. Write an equation of the line that goes through the point (4, -1) and is perpendicular to $x + 5y = 15$. (Put answer in slope-intercept form.)
5. Solve the system of equations.

$$\begin{aligned} -3x + y &= 10 \\ 5x + 4y &= 23 \end{aligned}$$

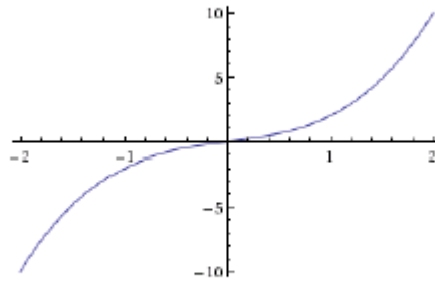
6. The selling price for a text book is \$62 and the total cost is given by $C(x) = 37x + 4,500$ where x is the number of textbooks.
 - (a) Find the revenue function, $R(x)$.
 - (b) Find the value of $C(20)$. Describe the meaning of this number.
 - (c) How many textbooks need to be sold in order to break even?
 - (d) What is the marginal profit?

7. Given $A = \begin{bmatrix} 4 & 2 & -3 & 1 \\ 0 & 5 & -2 & 7 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 5 \\ 1 & 6 \\ 0 & 2 \\ -3 & 1 \end{bmatrix}$ and $C = \begin{bmatrix} -2 & 8 \\ 0 & 3 \\ 5 & -1 \\ 1 & -4 \end{bmatrix}$ answer the

following questions. If the computation is impossible, state that and the reason why it's not possible.

- (a) Find C^T .
 - (b) Find a_{12} .
 - (c) Find $3B - C$.
 - (d) Find $A + B$.
8. If the supply function for a product is $p = 5q + 200$ and the demand function is $p = -2q + 410$, what is the equilibrium point?

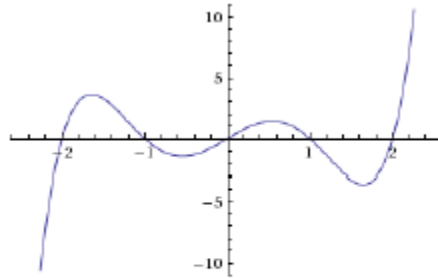
9. Determine which of the following graphs are functions? Circle the appropriate answer.
 (a)



Function

Not a Function

- (b)



Function

Not a Function

10. Given the points $(-1, 3)$ and $(4, -11)$
 (a) Write an equation of the line that passes through the points.
 (b) Is the line parallel to $6x+3y=15$? Why or why not?

11. Given the function $f(x) = \frac{x^2+1}{x+3}$, answer the following questions.

- (a) Find $f(3)$.
 (b) What is the domain of $f(x)$?
 (c) Find $f(w+h)$ and simplify your answer.
12. A manufacturing company makes refrigerators. Market research gives a supply function $p = 7q + 230$ and a demand function $p = -2q + 590$, where q is the quantity of refrigerators and p is the price in dollars. What is the equilibrium point?

13. A “community supported agriculture” farm is one where the farmer can sell directly to the customer. Farmer Hanley is trying to decide how many pepper and how many tomato plants he should put in a section of his farm.

- (a) Let p be the number of pepper plants and t be the number of tomato plants. Translate each of these conditions into an inequality:

Condition	Inequality
The plants need about the same space. The plot can hold at most 18 plants.	
He wants to plant at least twice as many peppers as tomatoes	
He wants to grow at least 4 tomato plants.	

(b) Graph the solution set and label the corners (vertices). Indicate the scale on the graph.

(c) Suppose each pepper plant produces 4 pounds of peppers and each tomato plant produces 10 pounds of tomatoes. How much of each should he plant to maximize the number of pounds of produce? Show how you can use an objective function to determine this.

14. A hamburger shop has fixed costs of \$165 per day and variable costs of \$2 per hamburger. The price for a hamburger is \$5. Let x be the number of hamburgers sold per day.

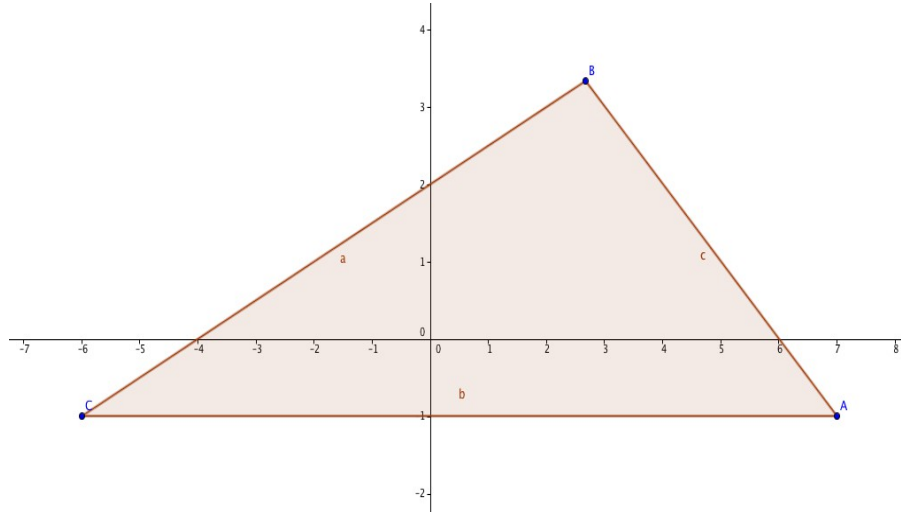
- Find the total cost function per day, $C(x)$.
- Find the revenue function, $R(x)$.
- What information about the situation does $R(100)$ give?
- How many hamburgers need to be sold per day in order to break even?

Answers:

1. $x = 15$

2. $x \geq \frac{9}{2}$

3. (a)



A: (7, -1)

B: $\left(\frac{8}{3}, \frac{10}{3}\right)$

C: (-6, -1)

(b) max of 47 at point (7, -1)

4. $y = 5x - 21$

5. (-1, 7)

6. (a) $R(x) = 62x$

(b) \$5240; cost of making 20 books

(c) 180

(d) 25

7. (a) $\begin{bmatrix} -2 & 0 & 5 & 1 \\ 8 & 3 & -1 & -4 \end{bmatrix}$

(b) 2

(c) $\begin{bmatrix} 5 & 7 \\ 3 & 15 \\ -5 & 7 \\ -10 & 7 \end{bmatrix}$

(d) can't do this operation because the sizes don't match

8. (q, p) = (30, \$350)

9. (a) Function

(b) Function

10. (a) $y = -\frac{14}{5}x + \frac{1}{5}$

(b) no because -2 and $-\frac{14}{5}$ slopes are not negative reciprocals of one another

11. (a) $\frac{5}{3}$

(b) $x \in \mathbb{R}, x \neq -3$

(c) $f(w+h) = \frac{w^2 + 2wh + h^2 + 1}{w+h+3}$

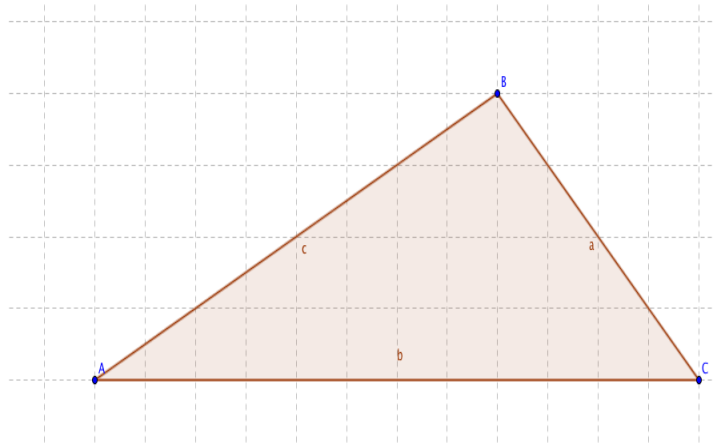
12. (q, p) = (40, \$510)

13. (a) (i) $p+t \leq 18$

(ii) $p \geq 2t$

(iii) $t \geq 4$

(b)



A: (8, 4)

B: (12, 6)

C: (14, 4)

(c) Objective function: $P = 4p + 10t$

max P-value of 108 pounds at point (12, 6)

14. (a) $C(x) = 165 + 2x$

(b) $R(x) = 5x$

(c) $R(100) = \$500$ which is the revenue (or money we bring in) from the sale of 100 burgers

(d) 55 burgers