Math 125 – Fall 2017
Exam 1A

Name: _____

Chapter 1, Sections 1-5
Chapter 2, Sections 1 ,2, 3, 5, 6
Chapter 3, Sections 1-2

Instructions: You must solve each question completely, explaining your reasoning. Partial credit will be awarded for answers that are incorrect, but show progress towards a correct solution. You will not receive credit if you do not clearly show how you are obtaining your answers. Grading will be based on the solution and your write-up. Do all the work on the exam.

1. *(24 Points)* Tiffany, a commissioned sales-person earns $100 base pay plus $10 per item sold. She has a total of 36 items.

   a. Express her gross salary G as a linear function of the number of x items sold.

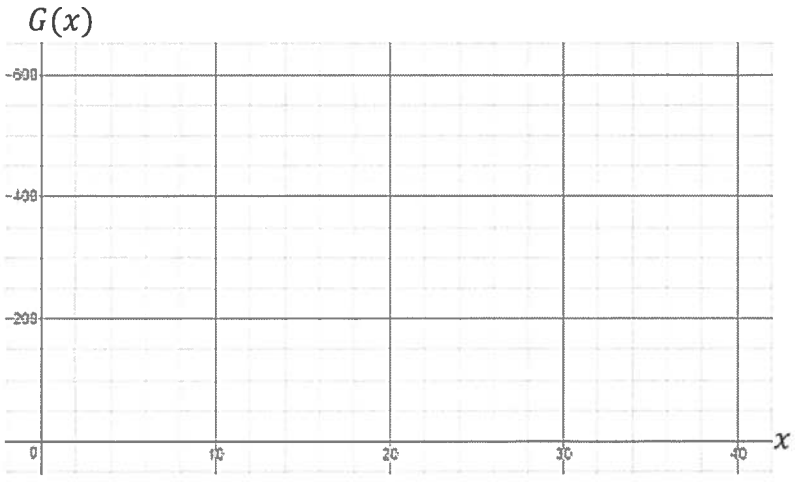
   b. What is the domain and range?

   c. Evaluate G(24) describe what they represent in this context.

   d. Interpret $G^{-1}(175) = 7.5$ in this context.

   e. Solve G(x) = 250 and describe what it represents in this context.

   f. Graph the function on the axis provided.



2. *(20 Points)* Cell phones have produced a seismic cultural shift. No other recent invention has incited so much praise—and criticism. In 2000 there were 109.4 million cell phone subscriptions in the United States; since then subscriptions steadily increased to reach 395.9 million in 2016. (Note: Some people had more than one subscription.)

   a. What was the average rate of change in **millions of cell phone subscriptions per year** between 2000 and 2016?

   b. Construct a linear function C(t) for cell phone subscriptions (in millions) **from 2000**.

   c. What is the slope of the line? Explain what the value of the slope means in the context of this problem.

   d. What is the vertical intercept of the line? Explain what the value of the vertical intercept means in the context of this problem.

   e. If U.S. cell phone subscriptions continue to increase at the same rate, how many will there be in 2025?

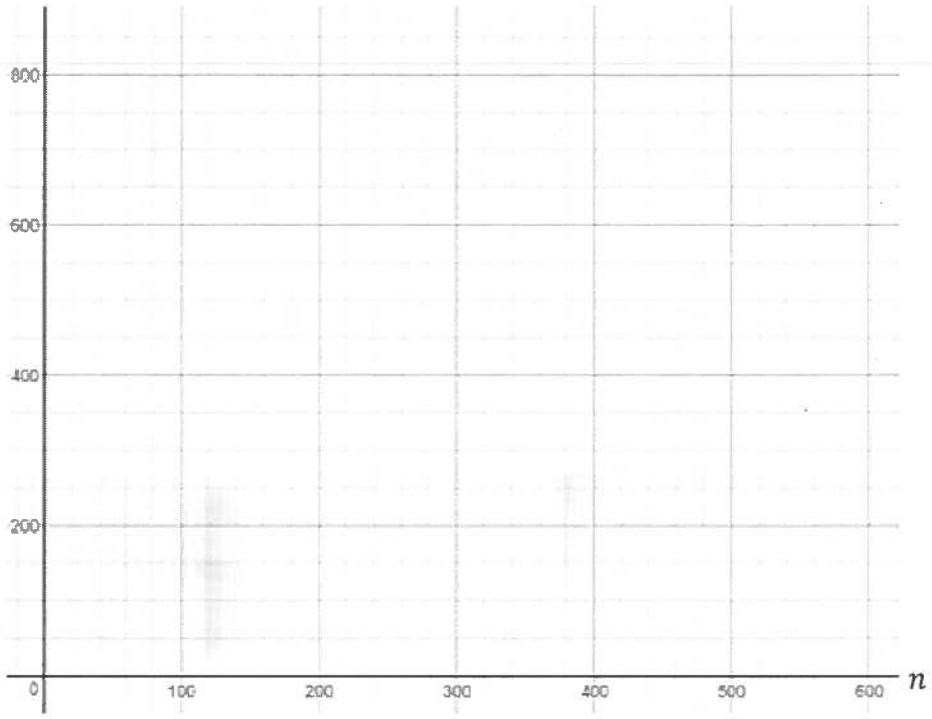
3. *(10 points) Doughy Delights* bakery has a fixed monthly cost of \$550 with an additional cost of \$0.20 per cookie, represented by the cost function

$$C(n) = 550 + .20n$$

where n is the number of cookies. The store manager sells each cookie for \$1.40 represented by the revenue function

$$R(n) = 1.40n$$

a. Graph the cost and revenue on the axes below.



b. Based on your graph, estimate how many cookies the manager need to sell before making a profit (revenue exceeds costs)?

4. *(20 points)* A model rocket is launched from the roof of a building. Its flight path is modeled by

$$h(t) = -5t^2 + 30t + 10$$

where h is the height of the rocket above the ground in meters and t is the time after the launch is seconds.

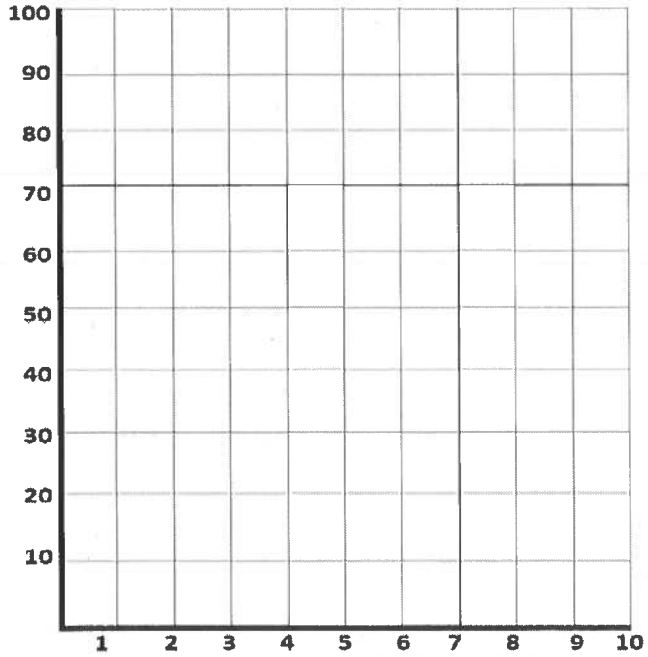
(a) Put this function in vertex form by completing the square.

(b) What was the maximum height of the model rocket?

(c) When did the model rocket reach its maximum height?

(d) If the model rocket does not get hit during flight, when does it hit the ground?

(e) Sketch a graph of the model rocket's path, make sure you correctly label your axis.



5. *(12 points)* Given line L: $3x + 2y = 12$

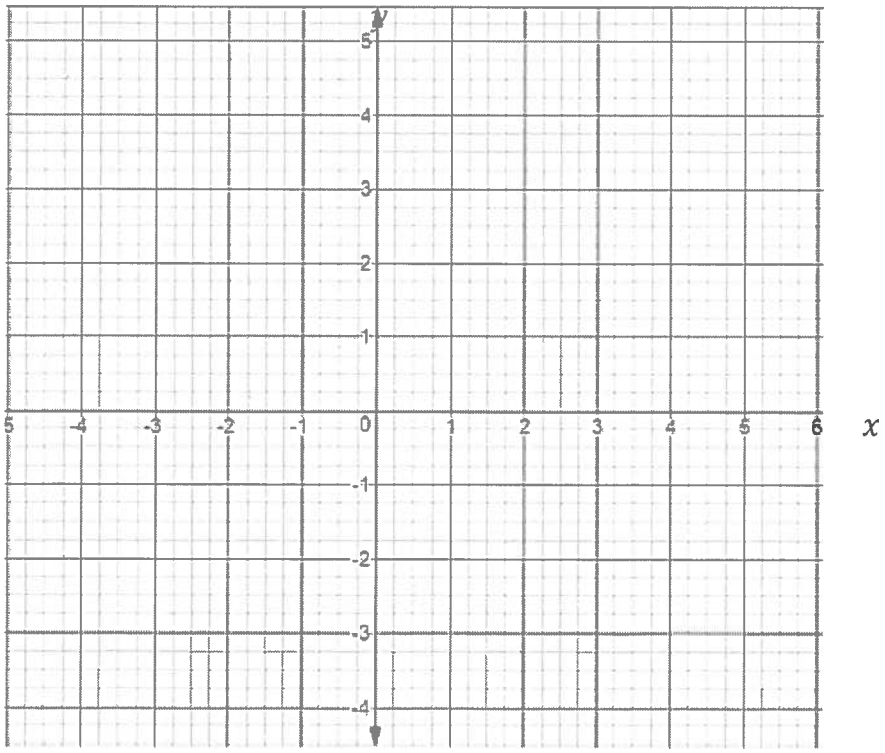
   a. What is the slope of line L?

   b. Write the equation (in slope-intercept form) of the line **parallel to line L** through the point $(2, 1)$.

   c. Write the equation (in point-slope form) of the line **perpendicular to line L** through the point $(-3, 5)$.

6. *(14 points)* Graph the following piecewise function over the indicated domain.

$$f(x) = \begin{cases} -x + 3, & x < 1 \\ 2x - 3, & 1 \le x < 2 \\ 1, & x \ge 2 \end{cases}$$



Bonus Question:

Evaluate the difference quotient for the given function. Simplify your answer.
(you will need to simplify the complex fraction)

$$f(x) = \frac{x+3}{x+1}, \text{ and } \frac{f(x)-f(1)}{x-1}$$