Midterm 1

Math 111

Winter 2020

You have 50 minutes to complete this exam. Other than a writing tool, you're allowed to use a scientific calculator only (one listed on the syllabus). When you're finished, first check your work if there is time remaining, then turn the exam in. If you have a question, don't hesitate to ask — I just may not be able to answer it.

1. (16 points) Suppose you own a lemonade stand. You sell each cup for the same amount of money, and you pay a one-time charge of \$10 for supplies. The total profit you earn from selling n cups, in dollars, can be modeled as the function $P(n) = 2.5n - 10$.

a) Find **and interpret** the value of $P(12)$.

b) Is this profit function linear? If it is, find and interpret the slope. If it is not linear, explain how you know this.

c) How many cups will you need to sell to earn \$490 in profit?

d) What is the **mathematical** domain of P?

2. (16 points) Let $G(t) = -5t^2 + 12t + 9$.

a) Find and simplify $G(2h + 1)$.

b) Find the horizontal and vertical axis intercepts of G.

c) Suppose G represents the height of a baseball thrown in the air, t seconds after it's thrown. What is the practical domain of G? Write your answer in interval notation. *Hint: the height of the ball shouldn't be negative.*

d) Continuing with the assumption from part c), how many seconds after it's thrown will the ball reach its maximum height?

3. (16 points) Suppose a function $F(y)$ is defined by

$$F(y) = \begin{cases} \frac{2}{y+1}, & y < 0 \\ 3, & 0 < y < 1 \\ \sqrt{y-2}, & y > 1 \end{cases}.$$

a) Find $F(-7)$ and $F(2)$.

b) List **all** values of y for which $F(y) = 3$.

c) What is the mathematical domain of F? Write your answer in interval notation.

d) What is the average rate of change of F on the interval $[-2, 6]$?

4. (16 points) Suppose that when a large number of cars are manufactured in bulk, the cost to manufacture each car is inversely proportional to the number of cars being manufactured.

a) Express this proportionality in a equation that contains $C(n)$, the cost in dollars to manufacture one car, and n, the number of cars manufactured.

b) Suppose $C(15) = 10,000$. Write a sentence interpreting this statement.

c) Using the fact that $C(15) = 10,000$, determine $C(30)$. Show all of your work.

d) What are the mathematical and practical domains of $C(n)$?