Midterm Exam One

Math 113-007/8 College Algebra

Colorado Mesa University Spring 2023
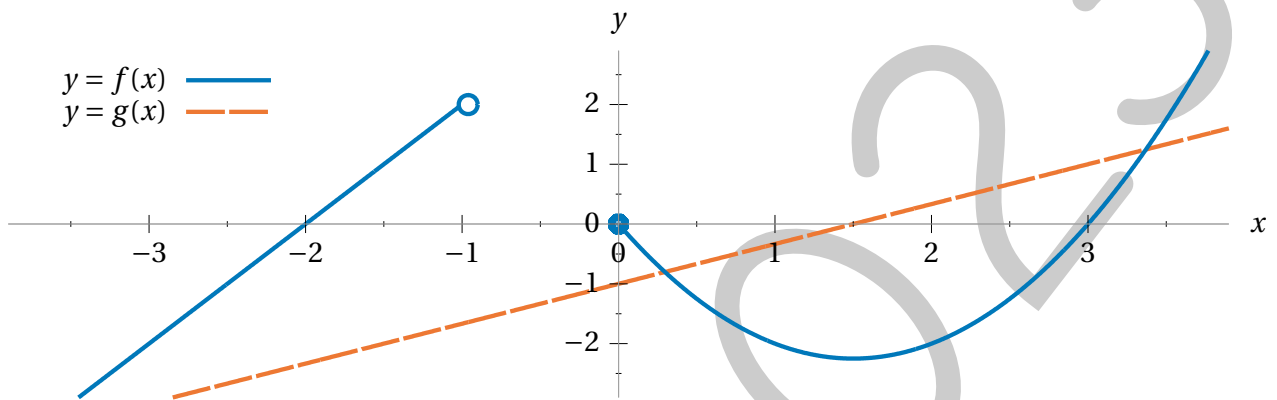
Name: _____

1. What's an equation for the line that has a slope of $\frac{2}{3}$ and passes through the point $(5, 0)$?

2. Does the point $(3, 1)$ lie on the graph of the function $f(x) = \frac{1}{3}x^2 - 2x$? In one sentence, state how you figured out the answer this question.

3. What is the slope of the line given by the equation $3x - 5y = 10$? Is this line *increasing* or *decreasing*?

4. Consider these graphs of functions f and g.

$y = f(x)$ ———
$y = g(x)$ – – –

(a) Estimating, what is $f(1)$? What is the domain of f? What is the range of f?

(b) Estimating, what is a reasonable formula for the function $g(x)$?

5. *Demonstrate algebraically* how to find the coordinates of the point where the lines of these two equations intersect.

$$y = \frac{5(x-3)}{6} - x \qquad\qquad y = 1 - \frac{x}{9}$$

6. Recall the formula for the future value A of an initial investment of P dollars at a simple interest rate r invested for t years is given by the formula $A = P(1 + rt)$.

   (a) Solve this equation for r in terms of the other variables.

   (b) If you would like to collect simple interest on a initial investment of \$300 and have \$600 after seven years, what interest rate would you need? Write the rate as a percentage.

7. Explain, as if explaining to a peer in the class, how you can tell the three points $(-1, 2)$ and $(1, 1)$ and $(5, 0)$ do *not* all lie on the same line.

8. A new Elkay ezH$_2$O water bottle refill station was just installed outside the CMU Math Department. It has a digital display that reports the number of "Bottles Saved" since it was installed. I've been occasionally recording this number since the beginning of the semester.

Day of the Semester	2	8	11	15	18	19
"Bottles Saved"	152	211	298	393	515	585

On these coordinate axes with x being the day of the semester and y being the number of "Bottles Saved", plot my data from the table. You don't need to be precise here.
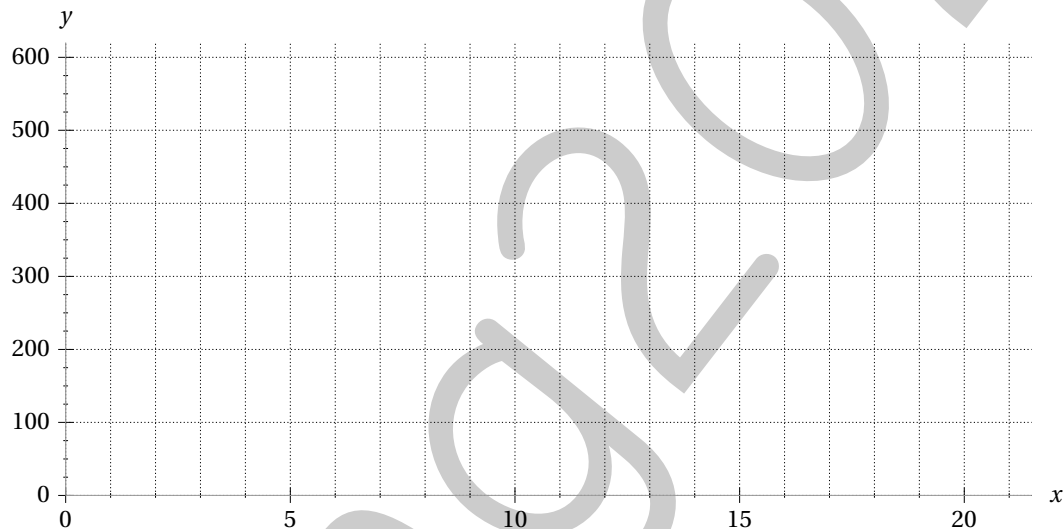
(a) Perform *linear regression* to find the linear model that best fits this data, and write down the formula for this model. (If you don't recall how to do this, you may simply sketch a line on the plot above that appears to fit the data well, and estimate what the formula for that line may be to use as your model.)

(b) According to your model, how many bottles are saved per day?

(c) Our final in the class is scheduled for the 115th day of this semester. According to the model, how many bottles will have been saved by the day of our final exam?

(d) According to the model, on what day will the number of "Bottles Saved" surpass 1000?

(e) Assuming the model is still accurate if we extend its domain to before the semester started, about how many days before the beginning of the semester was the Elkay installed?

(f) Do you think a linear function is a reasonable choice of model to accurately describe this situation? (Write down your thoughts, list pros and cons, etc)

9. Was there anything you were expecting to be on this exam, but was not?