Midterm Exam One

Math 113-001/6 College Algebra

Colorado Mesa University Fall 2022

Name: _____

1. What's a formula for the linear function f for which $f(0) = 7$, and for which the graph of f is parallel to the line $y = \frac{2}{3}x - 3$?

2. What is a formula of the linear function g corresponding to the input/output pairs listed in this table?

t	-2	1	4	7	10
$g(t)$	16	8.5	1	-6.5	-14

3. For which value(s) of ω is it true that

$$3.3\omega = 2.9\omega - 4^2?$$

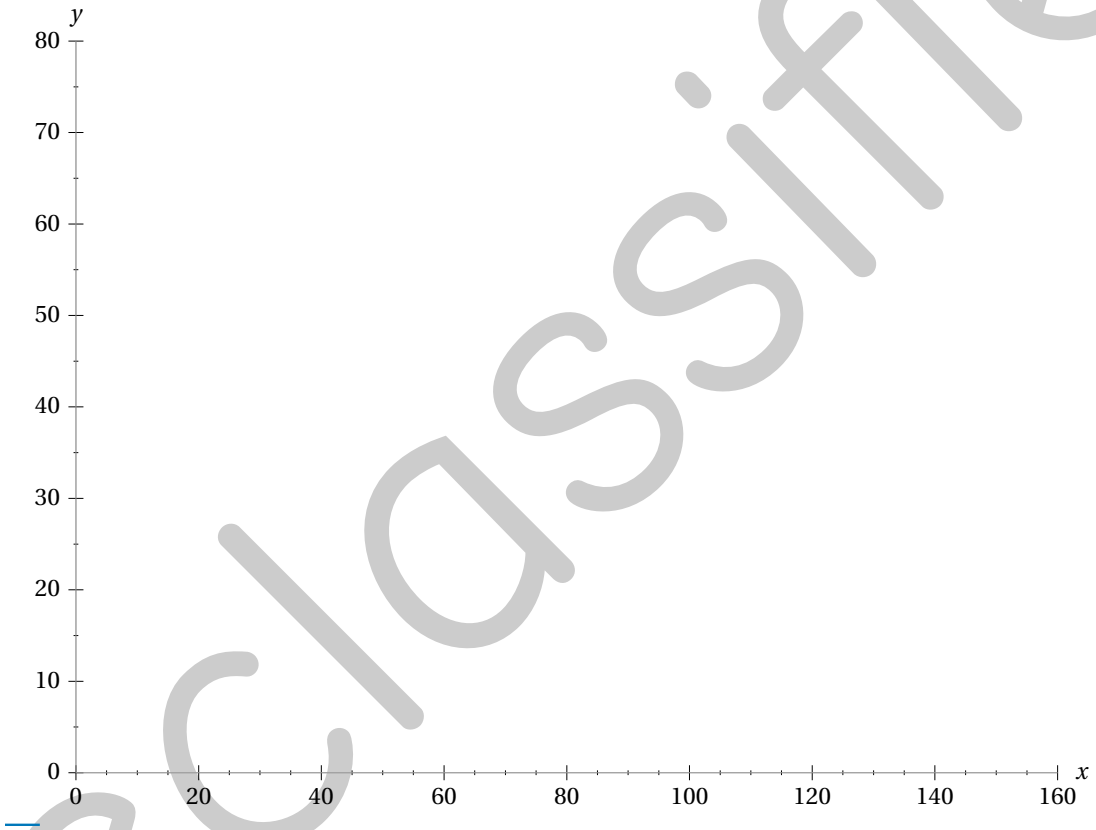
4. For which value(s) of b is it true that

$$\frac{3(b-7)}{2} = 1 - \frac{b}{3}?$$

5. Last Halloween I was feeling lazy and didn't want to answer the door for trick-or-treaters. So I bought two bulk boxes of Milky Way bars, emptied them into a bowl, and at 7pm put that bowl with a sign that says "take one" outside my front door. But curiosity got the best of me. I couldn't help but wonder how fast the candy bars would be taken, so I set an alarm to go off every 20 minutes to go count how many candy bars were left. Here is my data from that night.

Minutes since 7pm	0	20	40	60	80	100
Number of Candy Bars Left	72	60	55	41	36	22

On these coordinate axis plot my data from the table.



(a) Sketch a line on this graph that approximately fits my data. Estimating[1], write down an equation for this line to serve as a model for how many candy bars are left x minutes past 7pm.

[1]Note that since you're estimating, there is no *exact* correct answer here; I'm just hoping you come up with a reasonable model. Of course if you have a calculator you could perform *linear regression* on the data and get a good linear model.

(b) The data stops at 100 minutes past 7pm because I fell asleep on the couch. I'm curious what the next count would've been. According to the equation you came up with for you model, how many candy bars were left at 9pm? Does this match up with the number of candy bars that the line we sketched indicates should be left?

(c) I'm also curious how late into the night there was still candy left in the bowl. According to your model, about what time was the last candy bar taken?

(d) Next year I want to make sure the candy bars last until at least 11pm; I don't want to disenfranchise those late-night trick-or-treaters. Assuming your model will still be accurate next year, how many candy bars should I start with to ensure there is still candy left at 11pm?

6. What are the coordinates of the point where the lines $2x-3y=-11$ and $y=4x-23$ intersect?

7. Recall the formula for the future value A of an 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 $\$400$ and double your money after eight years, what interest rate would you need? Express the rate as a percent.

   (c) Suppose you invested some initial amount P four years ago at an annual interest rate of 6.25% You go to collect on your investment to find that the investment is worth $\$15\,000$! But you need to pay capital gains tax on your profit, so you need to know how much the initial investment P was. What must P have been? And what profit did you make?