Math 34A - Test 2

1. Short Problems

1.1. Problem 1. If x satisfies:

$$3 \cdot 3^{2x} - 26 \cdot 3^x - 9 = 0$$

what are the possible values for x?

Scratch Work

Answer:

1.2. Problem 2. Let:

$$x = \frac{\log(4) + \log(6) + \log(9)}{3}$$

What is 10^x? Simplify your answer as much as possible.

Scratch Work

Answer:

1.3. Problem 3. Suppose $5^{3x+2} = 200$. What is x?

Don't round your answer - if you have any log*'s, leave them in your answer.*

Scratch Work

Answer:

2. Multi-part problems

2.1. Problem 4 - Hot sauce.

2.1.1. *Set-up.* Today, we're making hot sauce. A Google search revealed a recipe that calls for:

- 2 Thai peppers.
- 1 cup of water.
- 2 cups of vinegar.

as well as some aromatics. Spiciness of a pepper is measured in Scoville units - refer to the following list to see how spicy various peppers are.

- Jalapeno peppers (3000 Scoville units).
- Serrano peppers (15,000 Scoville units).
- Thai peppers (70,000 Scoville units).
- Habanero peppers (150,000 Scoville units).
- Carolina reapers (2,000,000 Scoville units)

Unfortunately, we can't find any Thai peppers! All we have on hand are jalapenos and Carolina reapers.

(1) If we use only **jalapenos** instead of Thai peppers, how many do we need to match the spiciness of the original recipe?
(2) If we use only **Carolina reapers** instead of Thai peppers, how many do we need to match the spiciness of the original recipe?
(3) Ok, nobody wants to use that many jalapenos, and chopping up a Carolina reaper is hard to do precisely. We're just going to use a single Carolina reaper and use more water and vinegar to dilute the hot sauce.

    How many cups of water will we need?

2.1.2. *Scratch Work.*

2.1.3. *Answers.*

(1) How many jalapenos?

(2) How many Carolina reapers?

(3) How many cups of water?

2.2. Problem 5.

2.2.1. *Set-up.* I've drawn a parallelogram for you, with some of its vertices labelled.

(1) What are the coordinates of the missing vertex?

(2) Find the equation of the line that passes through the missing edge.

(*See Figure 1.*)

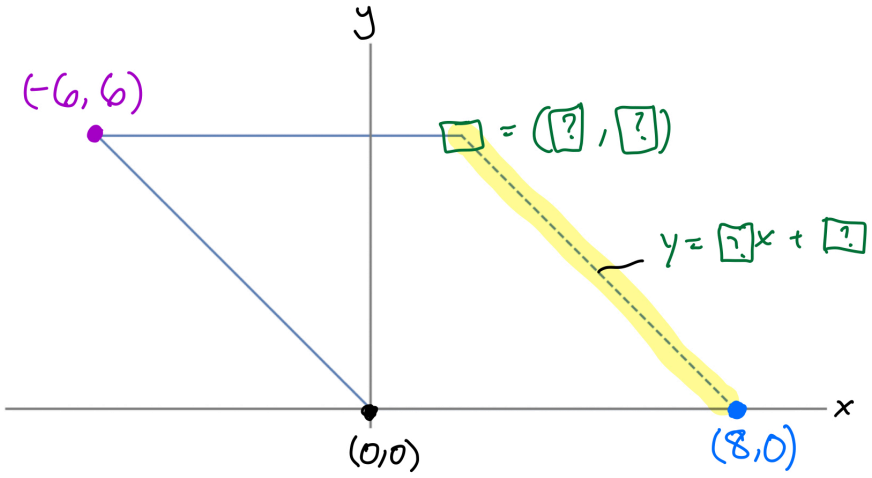

FIGURE 1. Parallelogram

2.2.2. *Scratch work.*

2.2.3. *Answers.*

(1) Coordinates of missing vertex:

(2) Equation of missing line (in $y = mx + b$ form):

2.3. Problem 6. *This problem was inspired by Episode 6 of Season 1 of Futurama (A Fishful of Dollars).*

Fry needs money in the year 3000. He remembers that his old bank account had some money in it, and has been accruing interest since the year 2000. Every year, he earned 1.5% interest.

(1) If Fry had one dollar in his account in the year 2000, how much would he have in the year 3000?

(2) When he goes to check his balance, Fry sees that he has 5,117,760 dollars. How much money did he have in the year 2000?

(3) What was Fry's balance in the year 2500?

2.3.1. *Scratch work.*

2.3.2. *Answers.*

(1) Balance in year 3000:

(2) Balance in year 2000:

(3) Balance in year 2500: