

## Math 34A - Test 2

### 1. Short Problems

**1.1. Problem 1.** If  $x$  satisfies:

$$2^{2x} - 12 \cdot 2^x + 32 = 0$$

what are the possible values for  $x$ ?

Scratch Work

Answer:

**1.2. Problem 2.** Let:

$$x = \frac{\log(24) - \log(6)}{2}$$

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

Scratch Work

Answer:

**1.3. Problem 3.** Suppose  $3^{4x+2} = 1728$ . 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:

- 18 jalapenos.
- 1 cup of water.
- 2 cups of vinegar.

as well as some aromatics.

Spiciness of a pepper is measured in Scoville units, and jalapenos have 5000 Scoville units each.

We only have 4 jalapenos on hand, but we have plenty of the following peppers:

- Anaheim peppers (1000 Scoville units).
- Serrano peppers (15,000 Scoville units).
- Cayenne peppers (50,000 Scoville units).
- Thai peppers (70,000 Scoville units).
- Habanero peppers (150,000 Scoville units).
- Ghost peppers (1,000,000 Scoville units)
- Carolina reapers (2,000,000 Scoville units)

- (1) What is the hottest pepper we could include without our hot sauce becoming spicier than the original recipe?
- (2) You decide to use all four of your jalapenos, and use serrano peppers to complete the recipe. How many serranos should you use if you want to make a hot sauce that is exactly as spicy as the original recipe?
- (3) You're really curious about the flavor of the Carolina reaper, but you want to dilute the spiciness with water/vinegar.

How many cups of water do you need to add to a Carolina reaper to make hot sauce that is as spicy as the original recipe?

2.1.2. *Scratch Work.*

2.1.3. *Answers.*

(1) Which pepper?

(2) How many serranos?

(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) Find the equations of the dashed lines.
- (2) Find the coordinates of the point in the center.

(See Figure 1.)

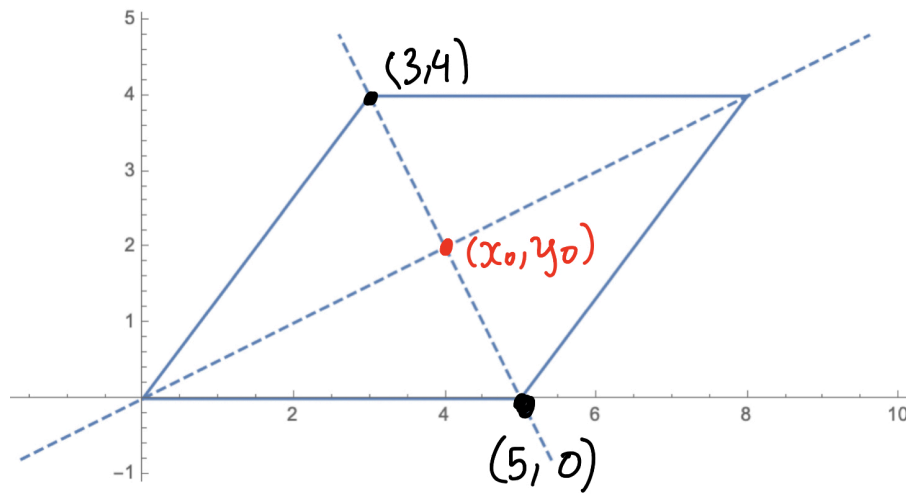


FIGURE 1. Parallelogram

2.2.2. *Scratch work.*

2.2.3. *Answers.*

(1) Equations of lines (in  $y = mx + b$  form):

(a)  $y =$

(b)  $y =$

(2)  $(x_0, y_0) =$

**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 25 cents, and has been accruing interest since the year 2000. Every year, he earned 1% interest.

- (1) If his memory is correct, how much money should Fry have in his bank account in the year 3000?
  
- (2) When he goes to check his balance, Fry sees that he has 314,388 dollars. The only explanation is that the amount in his account in the year 2000 was not 25 cents. How much money did he actually have in the year 2000?
  
- (3) Bender finds out that Fry got rich by accruing interest, and he decides he's going to become a millionaire by using a time machine to deposit money in Fry's bank in the year 2000. How much money should Bender deposit in the year 2000 if he wants to be a millionaire in the year 3000?



2.3.1. *Scratch work.*

2.3.2. *Answers.*

- |                                    |  |
|------------------------------------|--|
| (1) Expected balance in year 3000: |  |
| (2) Actual balance in year 2000:   |  |
| (3) Amount Bender should deposit:  |  |