Name:

Test 2: Ch 1-3

Complete the following problems to the best of your ability. **SHOW ALL OF YOUR WORK.** Unshown work will not be graded. You may use a calculator.

1. [25] Find equations for functions fitting the following qualifications.

   (a) The line passing through the points $(-2, 4)$ and $(3, 0)$

   (b) The horizontal line passing through $(4, 17)$

   (c) The line perpendicular to $y = \frac{1}{3}x + 1$ that goes through the point $(-1, 0)$.

   (d) The exponential function with initial value 8 that passes through the point $(1, 12)$

   (e) The exponential function with decay rate of -35% that passes through the point $(2, 10)$

2. [15] A company selling top hats for fancy dogs is investigating the supply and demand of their product. They collect the following data.

   (a) When the supply is 200, the price is $10. When the supply is 350, the price is $18. Find a linear equation giving $q$, the supply, in terms of $p$, the price.

   (b) When the price is $8, the demand is 450. When the price is $16, the demand is 280. Find a linear equation giving $q$, the demand, in terms of $p$, the price.

   (c) Find the price and quantity that gives the equilibrium point for this data.

3. [15] Find the **average** rate of change and the **percent** rate of change of the following functions over the given interval.

   (a) $f(x) = x^2 + 1$ over the interval $[0, 2]$

   (b) $g(x) = .5x + 1$ over the interval $[-1, 1]$

   (c) $h(x) = 10$ over the interval $[0, 5]$

4. [15] Suppose that for a given species of tree, the height that the tree grows in a year is a **linear** function of the amount of sunlight that it gets per day. It is found that if the tree gets 8 hours of light in a day, it will grow 3 meters in a year. If the tree gets 12 hours of light in a day, it will grow 3.5 meters in a year.

   (a) Find a function modeling $h$, the height gain of the tree, in terms of $l$, the amount of light it gets per day .

   (b) If a tree gets 10 hours of light a day, how much height should it gain in a year?

   (c) How many hours of light should a tree need to grow 4.2 meters in a year?

5. [10] Farmer O'Fencerty is back at it again. She needs to make another rectangular field, and has 800m of fencing available with which to pen in the area. This time, one side of the pen is bordered by a river, so she only needs to fence 3 sides. **See the board for an illustration.**

   (a) Find a formula for $A$, the area of the pen, in terms of $x$, the width of the pen.

   (b) Based on your formula, what is the area of the pen if the width is 300 meters?

6. [10] Suppose a bacterium doubles its population every twenty minutes.

   (a) 10 bacteria of this type are placed in a petri dish. Find a function that models $P$, the population of the bacteria, based on $t$, the number of **hours** since the experiment begins.

   (b) Calculate and interpret $P(6)$.

7. [15] Jeff has saved up $1000 and wants to invest it. He finds a fund that he can invest his money in that gives interest at a rate of 6%, compounded quarterly (4 times a year).

   (a) Give a function for $A$, the value of Jeff's investment based on $t$, the number of years since he first deposits his $1000.

   (b) Calculate and interpret $A(10)$.

   (c) How many years will it take for Jeff's investment to be worth at least $2000? (Hint: We don't know how to do this algebraically yet, so try guess-and-check with a few values of $t$)