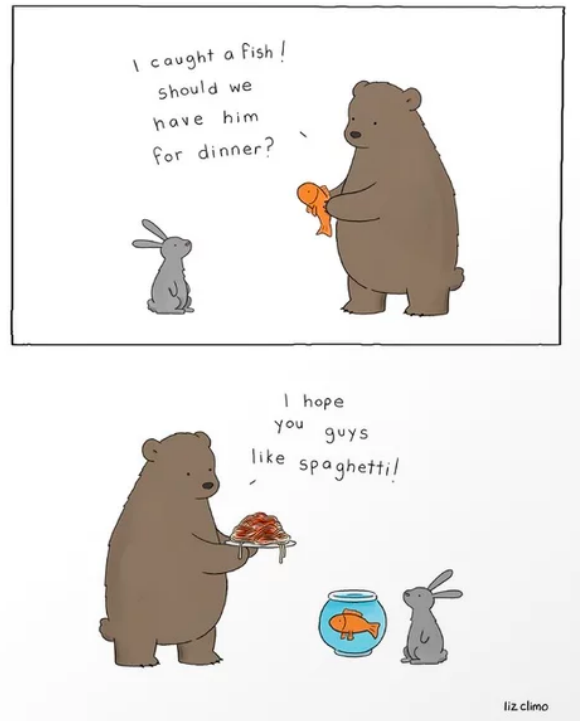
Math 146 - Calculus II Name________________________

Return to Differential Equations

A fish hatchery is tracking the number of fish in one of its ponds. Each week the population of fish grows by 4%, but also the owners remove 48 fish to sell. Let F represent the number of fish, and let t be time in weeks.



1. This description suggests that we can create a differential equation for $\dfrac{dF}{dt}$.
   We just need to include the amount of increase and decrease of the fish population. If there are F fish in the pond, what is the amount of **increase** of population after a week?

2. And what is the **decrease** in fish population each week?

3. Combine these to get a differential equation. You might want to have this checked before moving on.

4. Are there any values of F for which $\dfrac{dF}{dt} = 0$?

5. Values where the derivative is always zero are called equilibrium solutions. Why?

6. Before we solve our differential equation, let's think about how solutions will behave. If $F = 1500$, what is the value of $\frac{dF}{dt}$? What does this mean about a solution starting at $F(0) = 1500$?

7. If $F = 800$, what is the value of $\frac{dF}{dt}$? What does this mean about a solution starting at $F(0) = 800$?

8. Make a generalization about increasing/decreasing behavior from these examples: If $F >$_____ then the fish population is _____________, and if $F <$_____ then the fish population is _____________.

9. We will classify equilibrium solutions as stable or unstable. Which one do you think fits for our solution, $F = 1200$? Why?

10. Finally, use separation of variables to solve the initial value problem with $F(0) = 1000$, and sketch your solution for $0 \leq t \leq 40$.