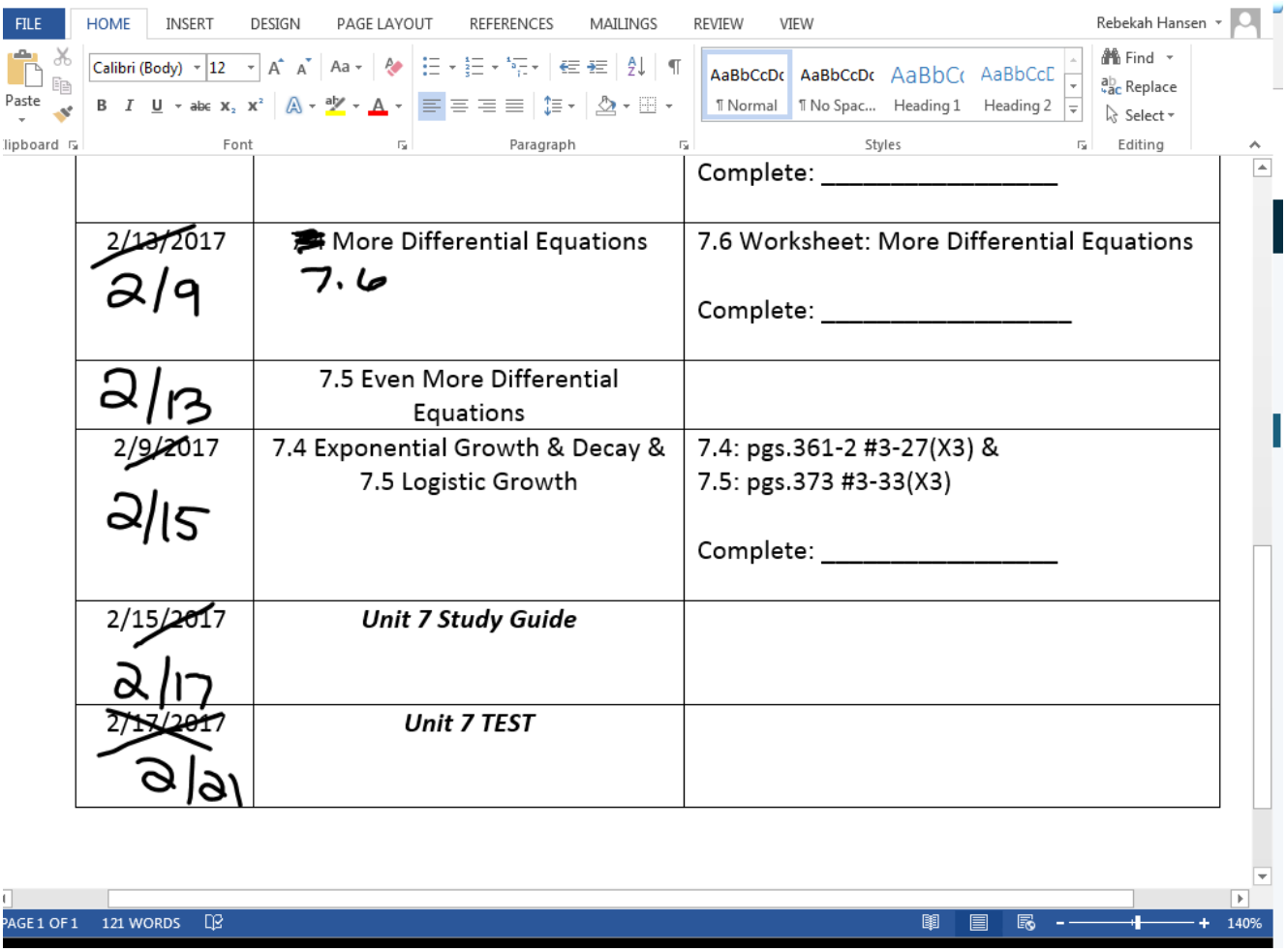
Our schedule for the week

Monday - Differential Equations Review
Wednesday - 7.4 and 7.5
Friday - Unit 7 Review

Next week:
Tuesday - Unit 7 Test

Nov 3-2:38 PM



		Complete: _____
2/13/2017 2/9	More Differential Equations 7.6	7.6 Worksheet: More Differential Equations Complete: _____
2/13	7.5 Even More Differential Equations	
2/9/2017 2/15	7.4 Exponential Growth & Decay & 7.5 Logistic Growth	7.4: pgs.361-2 #3-27(X3) & 7.5: pgs.373 #3-33(X3) Complete: _____
2/15/2017 2/17	***Unit 7 Study Guide***	
2/17/2017 2/21	***Unit 7 TEST***	

On Calculator...

TI-NSpire

http://www.dummies.com/education/graphing-calculators/how-to-graph-differential-equations-on-ti-nspire/

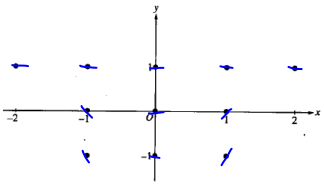
TI-84

-I have to give you a program

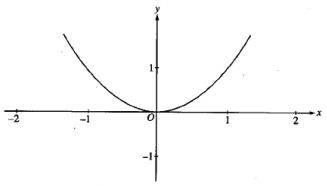
Feb 6-2:18 PM

4. Consider the differential equation given by $\frac{dy}{dx} = x(y-1)^2$.

(a) On the axes provided, sketch a slope field for the given differential equation at the eleven points indicated.



(b) Use the slope field for the given differential equation to explain why a solution could not have the graph shown below.



(c) Find the particular solution $y = f(x)$ to the given differential equation with the initial condition $f(0) = -1$.

(d) Find the range of the solution found in part (c).

$\frac{dy}{dx} \cdot dx = x(y-1)^2 \cdot dx$

$\frac{dy}{(y-1)^2} = \frac{x(y-1)^2}{(y-1)^2} dx$

$\int \frac{dy}{(y-1)^2} = \int x\,dx$

$u = y-1$

$du = dy$

$\int u^{-2}\,du = \frac{x^2}{2} + C$

$\frac{u^{-1}}{-1} = \frac{x^2}{2} + C$

$-1(y-1)^{-1} = \frac{x^2}{2} + C$

$\frac{-1}{y-1} = \frac{x^2}{2} + C$

$(0,-1) \rightarrow \frac{-1}{-1-1} = \frac{0^2}{2} + C$

$\frac{1}{2} = 0 + C$

$\frac{1}{2} = C$

$-\frac{1}{(y-1)} = \frac{x^2}{2} + \frac{1}{2}$

$\frac{-1}{(y-1)} = \frac{x^2+1}{2}$

$\frac{-2}{(x^2+1)} = \frac{(y-1)(x^2+1)}{(x^2+1)}$

$\frac{-2}{(x^2+1)} = y-1$

$+1 \quad +1$

$\frac{-2}{(x^2+1)} + 1 = y$

$\frac{-2}{(x^2+1)} + \frac{1(x^2+1)}{(x^2+1)} = y$

$\frac{x^2-1}{x^2+1} = \frac{-2+x^2+1}{(x^2+1)} = y$

$y = \frac{x^2-1}{x^2+1}$

$\frac{2}{2}$

Proper $n < d$

Improper $n \geq d$

d) Range $[-1, 1)$

Horizontal Asy @ $y = 1$ (No vert asy)

y-int $(x=0)$ $(0,-1)$

x-int $x^2 - 1 = 0$

Feb 7-2:11 PM

5. The rate at which a baby bird gains weight is proportional to the difference between its adult weight and its current weight. At time $t = 0$, when the bird is first weighed, its weight is 20 grams. If $B(t)$ is the weight of the bird, in grams, at time t days after it is first weighed, then

$\frac{dy}{dx} \rightarrow B = y \quad t = x$ $\qquad \frac{dB}{dt} = \frac{1}{5}(100 - B).$ $\qquad B \geq 20 \text{ grams}$

Let $y = B(t)$ be the solution to the differential equation above with initial condition $B(0) = 20$.

(a) Is the bird gaining weight faster when it weighs 40 grams or when it weighs 70 grams? Explain your reasoning.

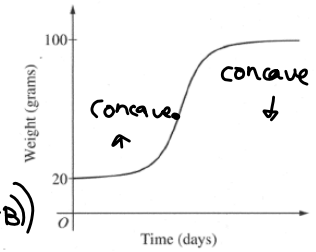
$\frac{1}{5}(100-40) = \frac{1}{5} \cdot 60 = 12 \qquad \frac{1}{5}(100-70) = \frac{1}{5} \cdot 30 = 6$

(b) Find $\frac{d^2B}{dt^2}$ in terms of B. Use $\frac{d^2B}{dt^2}$ to explain why the graph of B cannot resemble the following graph.

$\frac{d^2B}{dt^2} = 20 - \frac{1}{5}B$

$\frac{d^2B}{dt^2} = -\frac{1}{5} \cdot \frac{dB}{dt}$

$\frac{d^2B}{dt^2} = -\frac{1}{5}\left(\frac{1}{5}(100-B)\right)$



(c) Use separation of variables to find $y = B(t)$, the particular solution to the differential equation with initial condition $B(0) = 20$.

$\frac{dB}{dt} = \frac{1}{5}(100-B)$

$\int \frac{dB}{(100-B)} = \int \frac{1}{5}dt \qquad u = 100-B, \; du = -dB, \; -du = dB$

$-\int \frac{du}{u} = \frac{1}{5}t + C$

$-\ln|u| = \frac{1}{5}t + C$

$-\ln|100-B| = \frac{1}{5}t + C$

$t \; B \quad (0, 20) \rightarrow$

$-\ln|100-20| = \frac{1}{5}(0) + C$

$-\ln 80 = C$

$\Rightarrow -\ln|100-B| = \frac{1}{5}t - \ln 80$

$+\ln 80 \qquad +\ln 80$

$-\ln|100-B| + \ln 80 = \frac{1}{5}t$

$-(\ln|100-B| - \ln 80) = \frac{1}{5}t$

$-\ln\left(\frac{|100-B|}{80}\right) = \frac{1}{5}t$

$B \geq 20$

$\ln\left(\frac{|100-B|}{80}\right) = -\frac{1}{5}t$

$e \qquad e$

$80 \cdot \frac{|100-B|}{80} = 80e^{-\frac{t}{5}}$

$|100-B| = 80e^{-t/5}$

$100-B = 80e^{-t/5}$

$\star \; 100 - 80e^{-t/5} = B$

Check $(0, 20)$

$100 - 80e^{-0/5} = 20$

$100 - 80 = 20 \; \checkmark$

$100-B = -80e^{-t/5}$

$100 + 80e^{-t/5} = B \quad$ no

$100 + 80e^{-0/5} = 20$

$180 \neq 20$

Homework

Finish 7.6 Worksheet

Oct 21-8:47 AM