Chapter 7: Diff. Eqs. & Num. Methods
Review Assignment

Name:

Date:

Your Target Grade For This Chapter: (MUST Indicate)
Please CIRCLE One Of: A+ A B C
(This helps the marker give you feedback.)

- **This assignment is to help YOU. It will identify 3 things for you:**
  1. **How much of this chapter you really understand,**
  2. **What you need more practice on before the test,**
  3. **And whether you're doing each step correctly.**
- **Some of the answers are on the last page – what *we* want to see is your *work*. So show *all* necessary work, or you'll see stuff written down *right around here*… ↑ ☺**

This assignment...	
Is Good To Go!	**Needs More Work On Question(s):**

1. Answer true or false: The function $y = \cos(5t) + C$ solves the differential equation $y'' - 5y' = 0$.

2. Solve the differential equation: $\frac{dy}{dx} = \frac{9x^3}{3y+\sin y}$.

3. For the differential equation:

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

a) Find the general solution, $y(x)$.

b) Find a specific solution that passes through the point (0,0).

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4. Solve for y: $y' = \frac{1+y^6}{xy^5}$, where $y(1) = 1$.

5. a) Find the linearization of $f(x) = \sqrt{2-x}$ at the point x = -3.

b) Use (a) to approximate f(-2.9).

c) What is the % Error of that approximation?

6. An initial rabbit population of 3000 grows exponentially at a rate of 20% per year.

a) Write a differential equation that represents this problem.

b) Find a formula for the rabbit population, P, as a function of time, t. (You don't have to show the derivation of it.)

c) How long will it take until the rabbit population doubles?

d) How long *ago* was the rabbit population 100? (assume the same rate of growth)

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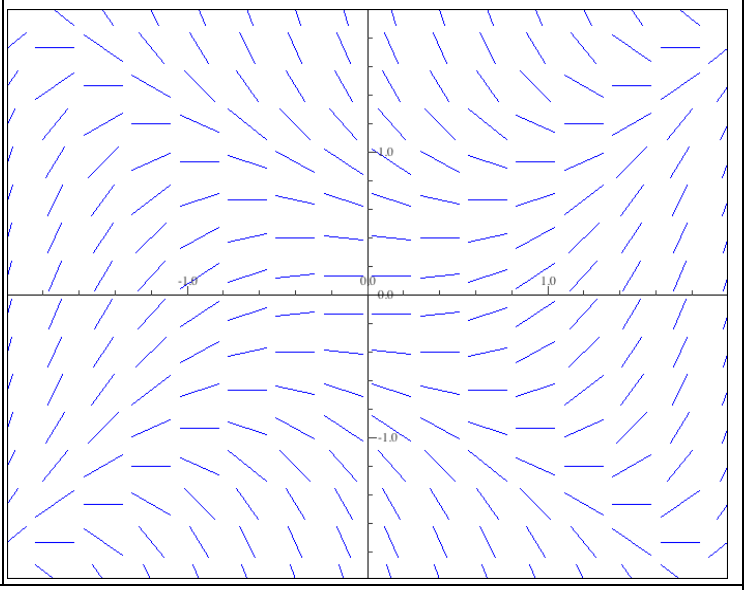
7. If 400 g of a radioactive substance decays to 25 g in 15 years, then what is the half-life of the substance?

8. Given the slope field below (which has a window of x[-2,2] and y[-2,2]) for the differential equation $\frac{dy}{dx} = x^2 - y^2$, sketch the 3 solution curves that go through the initial points: (-1, -1), (1, 0), and (0, 1).

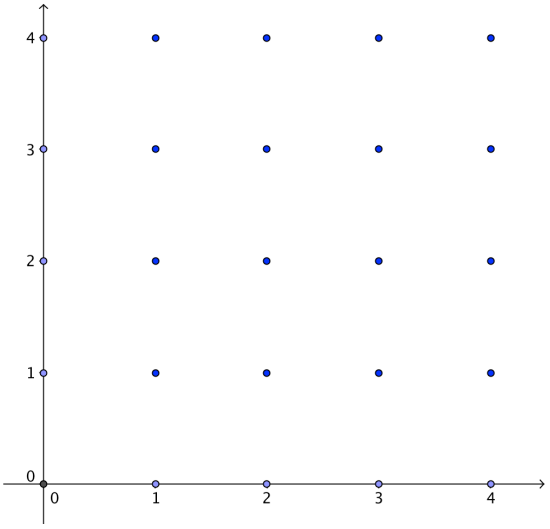


9. Consider the differential equation: $\frac{dy}{dx} = \tan(x)$.

a) Calculate the value of the slope, $\frac{dy}{dx}$, at (0,1) and(1,2).

b) Use the grid to the right to sketch the slope field for the given diff. eq. at the 25 indicated points: (the integers from $x = 0$ *to* 4 *and* $y = 0$ *to* 4)

c) Why does the slope field have the *same slope throughout each column*? (Hint: look at the actual differential equation – what do you notice?)



Grid for question (b)

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10. Using Newton's method and an initial guess of $x_0 = -3$, approximate the solution of $x^3 - 3x + 3 = 0$ by showing the calculations for the first three iterations (x_1, x_2, & x_3).
(Note: Write at least 4 dec. places down, but use all dec. places in your actual calculations (in your calc).)

11. Approximate $\int_0^3 (t^3 - 2t)$ by dividing the interval up into 6 equal regions, and using:

a) The Trapezoidal Rule

b) Simpson's Rule

12. For the differential equation $\frac{dy}{dx} = \sec(y)$, with an initial value of $y(0) = 2$, use Euler's Method with a step size of 0.2 to approximate $y(0.6)$ to 4 decimal places.

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13. **[Audio question!]** Answer the following question with a 90 second (**max**) audio recording, saved as an ".mp3", and upload it separately (or give the link to it) in the same hand-in box for this assignment.

- What is the difference between the general solution of a differential equation and a specific solution that passes through a certain point (satisfies an initial condition)?

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(No need to upload this page)

CHECK WITH THESE *BEFORE* SUBMITTING

Answers for some of the questions:

(Remember: Do these on your own, and submit your best effort.)

1. -----

2. $\frac{3y^2}{2} - \cos(y) = \frac{9x^4}{4} + C$

3. a) $y = \tan(-\cos(2x) + C)$ b) $y = \tan(-\cos(2x) + 1)$

4. $y = \sqrt[6]{2x^6 - 1}$ (Hint: After separating the variables, in order to get the antiderivative, think *substitution*…)

5. a) $L(x) = \sqrt{5} - \frac{1}{2\sqrt{5}}(x + 3)$ b) $\cong 2.21$ c) $\cong 0.005\%$

6. a) ------ b) $y = 3000e^{0.2t}$ (you don't have to show the derivation)

c) $\cong 3.47$ years d) $\cong 17.01$ years ago

7. 3.75 years

8. -----

9. a) $\left.\frac{dy}{dx}\right|_{(0,1)} = 0$ and $\left.\frac{dy}{dx}\right|_{(1,2)} \cong 1.56$ b) ----- c) -----

10. $x_1 = -2.3750$, $x_2 = -2.1400$ …, $x_3 = -2.1046$ …

11. a) 11.8125 b) 11.25

12. 5.7229

13. ----- Need help on recording sound on a Mac?

- Do an internet search with something like "easy record voice Mac mp3"

Need help on recording sound on a PC?

- Do an internet search with something like "easy record voice PC mp3"