

MATH 116 — PRACTICE FOR EXAM 3

Generated November 28, 2017

NAME: _____

INSTRUCTOR: _____ SECTION NUMBER: _____

1. This exam has 4 questions. Note that the problems are not of equal difficulty, so you may want to skip over and return to a problem on which you are stuck.
2. Do not separate the pages of the exam. If any pages do become separated, write your name on them and point them out to your instructor when you hand in the exam.
3. Please read the instructions for each individual exercise carefully. One of the skills being tested on this exam is your ability to interpret questions, so instructors will not answer questions about exam problems during the exam.
4. Show an appropriate amount of work (including appropriate explanation) for each exercise so that the graders can see not only the answer but also how you obtained it. Include units in your answers where appropriate.
5. You may use any calculator except a TI-92 (or other calculator with a full alphanumeric keypad). However, you must show work for any calculation which we have learned how to do in this course. You are also allowed two sides of a $3'' \times 5''$ note card.
6. If you use graphs or tables to obtain an answer, be certain to include an explanation and sketch of the graph, and to write out the entries of the table that you use.
7. You must use the methods learned in this course to solve all problems.

Semester	Exam	Problem	Name	Points	Score
Winter 2012	2	5		13	
Fall 2016	2	4		12	
Winter 2013	2	2		13	
Fall 2015	2	5		10	
Total				48	

Recommended time (based on points): 43 minutes

5. [13 points] Consider the following differential equations

A. $y' = 2x$

B. $y' = 5y - 1$

C. $yy' = 2$

D. $y' = \frac{y}{x}$

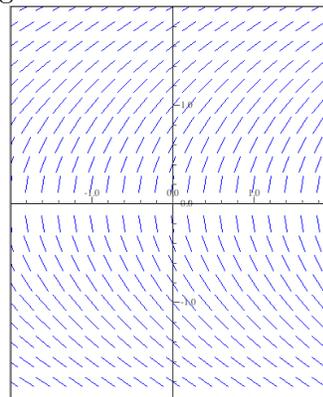
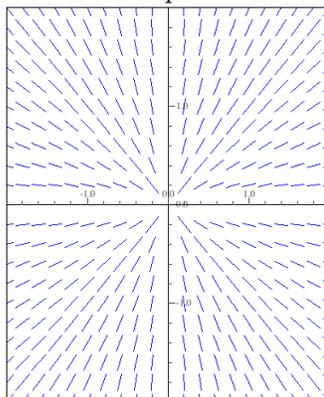
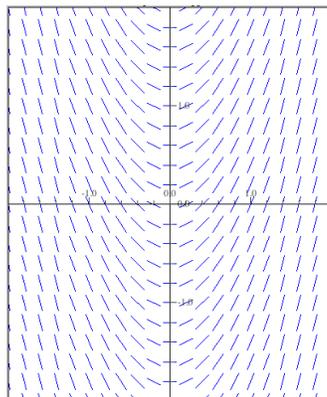
a. [6 points] Each of the following functions is a solution to one of the differential equations listed above. Indicate which differential equation with the corresponding letter (A,B,C or D) on the given line.

1. $y = \frac{1}{5} + e^{5x}$ _____

3. $y = 2\sqrt{x}$ _____

2. $y = x^2 + 1$ _____

b. [3 points] Each of the following slope fields belongs to one of the differential equations listed above. Indicate which differential equation on the given line.



c. [4 points] Find the equilibrium solutions of the differential equations given above (if any). Write the equation of the equilibrium solutions in the space provided below. If the equation does not have equilibrium solutions, write none.

A. _____

B. _____

C. _____

D. _____

4. [12 points] Each graph below is a slope field for one of the differential equations. Beneath each slope field, write the letter of the differential equation in the blank. There is only one correct differential equation for each slope field. Assume $A > 0$ and $B < 0$ are constants. You do not need to show your work. Any ambiguous answers will be marked incorrect.

(N) $\frac{dy}{dx} = (A - y)^2(B - y)$

(P) $\frac{dy}{dx} = (A + y)(B + y)^2$

(Q) $\frac{dy}{dx} = (A - y)(B - y)$

(R) $\frac{dy}{dx} = (y - A)(B - y)$

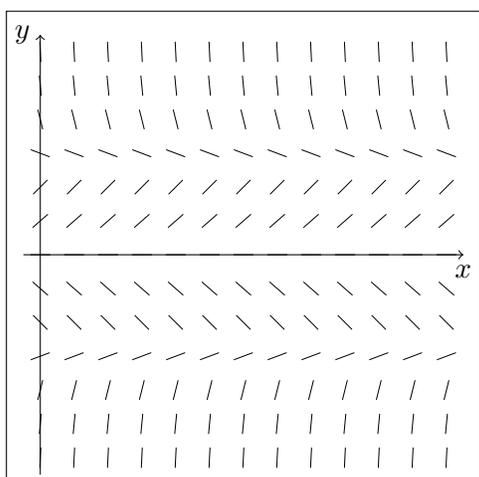
(S) $\frac{dy}{dx} = (y - A)^2(y + B)$

(T) $\frac{dy}{dx} = y(A - y^2)$

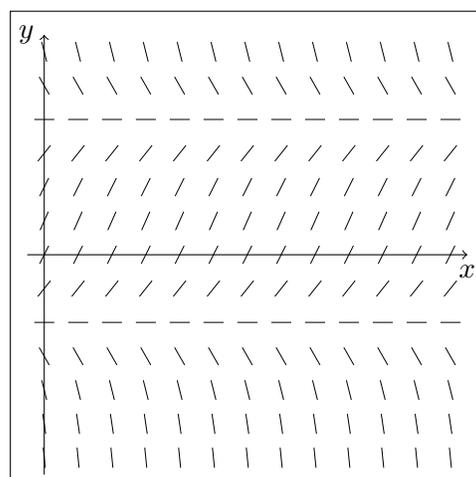
(V) $\frac{dy}{dx} = y(y^2 + B)$

(W) $\frac{dy}{dx} = y(y^2 - B)$

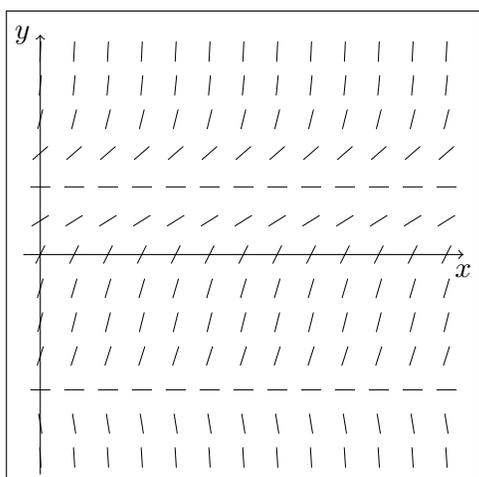
(Z) $\frac{dy}{dx} = y^2(y + A)$



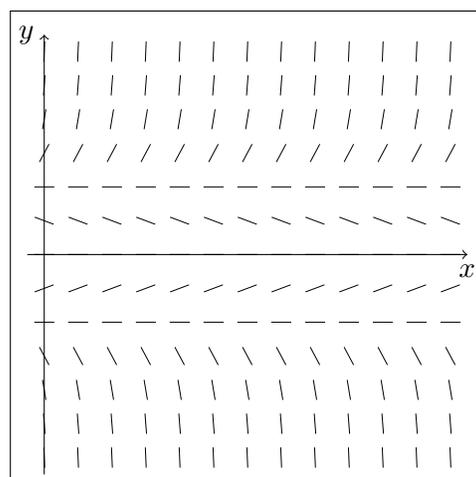
Answer: _____



Answer: _____



Answer: _____



Answer: _____

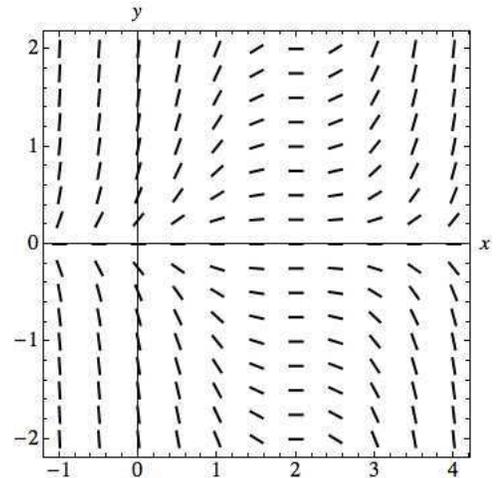
2. [13 points]
 a. [7 points] Consider the following differential equations:

A. $y' = y(x - 2)^2$ B. $y' = y(x - 2)$ C. $y' = -y(1 - y)$ D. $y' = -y^2(1 - y)$

Each of the following slope fields belongs to one of the differential equations listed above. Indicate which differential equation on the given line. Find the equation of the equilibrium solutions and their stability. If a slope field has no equilibrium solutions, write none.

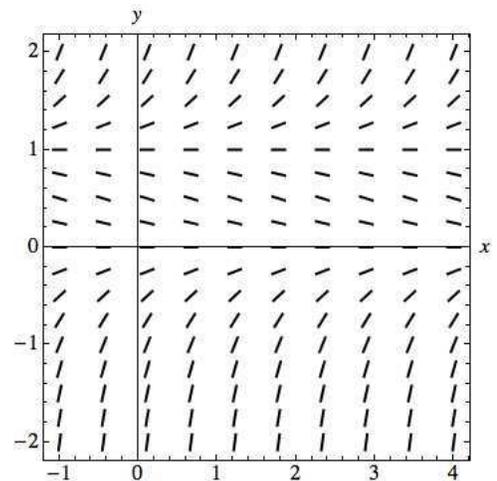
Differential equation: _____

Equilibrium solutions and stability:

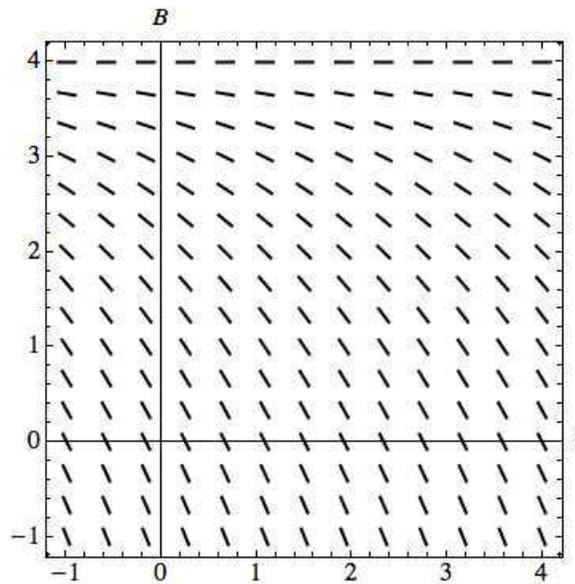


Differential equation: _____

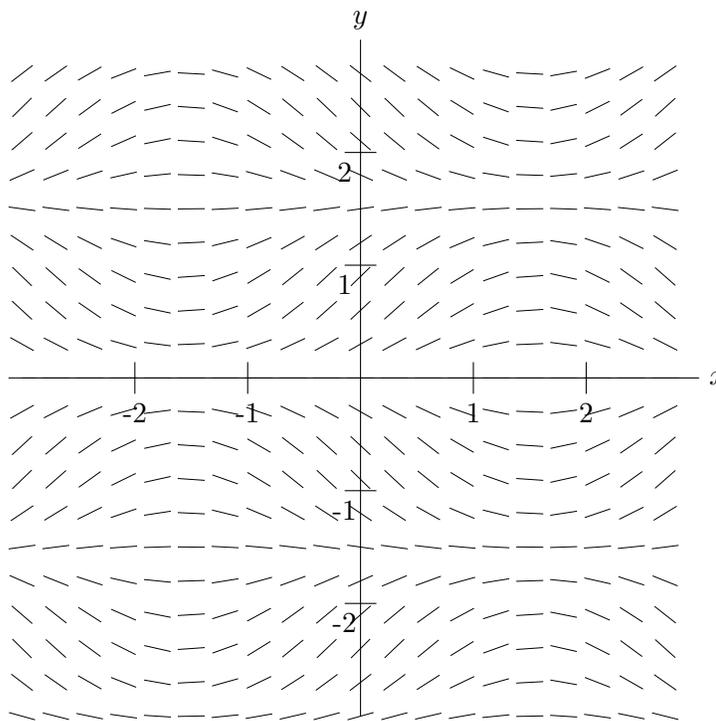
Equilibrium solutions and stability:



- b. [4 points] A bank account earns a p percent annual interest compounded continuously. Continuous payments are made out of the account at a rate of q thousands of dollars per year. Let $B(t)$ be the amount of money (**in thousands of dollars**) in the account t years after the account was opened. Write the differential equation satisfied by $B(t)$.
- c. [2 points] The slope field shown below corresponds to the differential equation satisfied by $B(t)$ (for certain values of p and q). Sketch on the slope field below the solution to the differential equation that corresponds to an account opened with an initial deposit of 3,000 dollars.



5. [10 points] The graph of a slope field corresponding to a differential equation is shown below.



- a. [4 points] On the slope field, carefully sketch a solution curve passing through the point $(-1,-1)$.
- b. [2 points] The slope field pictured above is the slope field for one of the following differential equations. Which one? Circle your answer. You do not need to show your work.

$$\frac{dy}{dx} = \cos x \cos(2y)$$

$$\frac{dy}{dx} = \sin x \cos(2y)$$

$$\frac{dy}{dx} = \cos x \sin(2y)$$

$$\frac{dy}{dx} = \sin x \sin(2y)$$

- c. [4 points] Find two equilibrium solutions to the differential equation you circled.