UBC ID #: _____ NAME (print): _____

Signature: _____

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THE UNIVERSITY OF BRITISH COLUMBIA

Irving K. Barber School
of Arts and Sciences
UBC Okanagan

Instructor: Rebecca Tyson Course: MATH 225
Date: Feb 8th, 2017 Time: 11:30am Duration: 35 minutes.
This exam has 5 questions for a total of 20 points.

**SPECIAL INSTRUCTIONS**

- Show and explain all of your work unless the question directs otherwise. Simplify all answers.
- The use of a calculator is not permitted.
- Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, ask for extra paper.

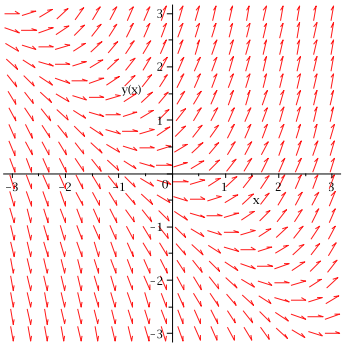
This is a two-stage exam. You have 35 minutes to complete the exam individually, then you will hand in the tests and join your group to redo the test as a group in the remaining 35 minutes.

| Question: | 1 | 2 | 3 | 4 | 5 | Total |
|---|---|---|---|---|---|---|
| Points: | 4 | 4 | 4 | 6 | 2 | 20 |
| Score: | | | | | | |

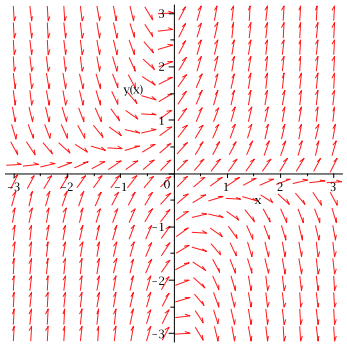
4 1. Consider the two ODEs

$$\boxed{\text{A}}\ \frac{dy}{dx} = 1 - xy, \qquad \boxed{\text{B}}\ \frac{dy}{dx} = x + y.$$

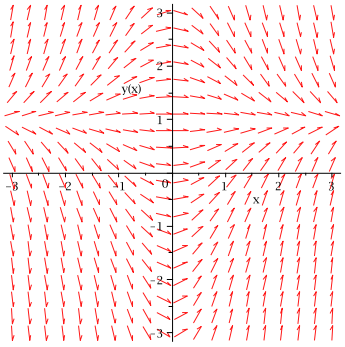
For each ODE, determine the corresponding direction field below, and justify your choice.



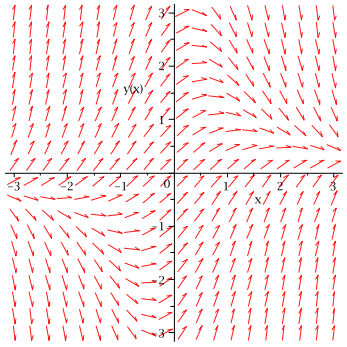

(a)




(b)




(c)




(d)

4 2. Show that $x^4y^3$ is an integrating factor for the ODE

$$(3y^2 - 6xy)\,dx + (3xy - 4x^2)\,dy = 0.$$

4 3. Solve the initial value problem

$$\frac{dy}{dx} = 3x^2(1 + y^2), \quad y(0) = 1.$$

6 4. Find the general solution to the ODE

$$\frac{dr}{d\theta} = -r\tan(\theta) + \sec(\theta).$$

2 5. Write the Backward Euler approximation for the ODE in question 4.