

MATH 307D
Midterm 1
July 12, 2013

Name _____

Student ID # _____

- Your exam should consist of this cover sheet, followed by 5 problems. Check that you have a complete exam.
- Unless otherwise indicated, show all your work and justify your answers.
- Unless otherwise indicated, your answers should be exact values rather than decimal approximations. For example, $\frac{\pi}{4}$ is an exact answer and is preferable to 0.7854.
- You may use a scientific calculator and one double-sided 8.5×11-inch sheet of handwritten notes. All other electronic devices, including graphing or programmable calculators, and calculators which can do calculus, are forbidden.
- The use of headphones, earbuds during the exam is not permitted. Turn off all your electronic devices and put them away.
- If you need more space, write on the back and indicate this. If you still need more space, raise your hand and I'll give you some extra paper to staple onto the back of your test.
- Academic misconduct will guarantee a score of zero on this exam. **DO NOT CHEAT.**

Problem	Points	S C O R E
1	10	
2	10	
3	10	
4	10	
5	10	
Total:	50	

1. (10 points) Find the general solution of the differential equation

$$y' = (\sin t)(y - 2)^2.$$

2. (10 points) Solve the initial value problem:

$$y' = 2y + e^t + e^{2t}, \quad y(0) = 0.$$

3. (10 points) Consider the equation

$$y' = \frac{-y}{(y^2 + 1)^3}.$$

Analyze it qualitatively. Find constant solutions and classify them (stable/unstable/semistable). Draw the graph of increasing/decreasing/constant solutions.

4. (10 points) Find $y(1), y(2), y(3)$ using Euler's method with $h = 1$ for the following initial value problem:

$$y' = y^2 - yt, \quad y(0) = 1.$$

5. (10 points) You have one million dollar (lottery jackpot) in your savings account. The annual interest is 5%, but it is added continuously. You continuously withdraw one hundred thousand dollars annually to sustain your living. How long can you live on this money?