

Mathematics 352

Exam 2

April 3, 2013; 60 minutes

Name: _____

This exam is closed book; you can use a calculator (*not* a cell-phone calculator) but no other electronic aids or printed references. *If the wording or intent of any question is unclear, please ask me to clarify.* I am not trying to confuse you with the problem statements.

You can use your own paper or the provided blank copy paper. DO NOT WRITE ANYTHING YOU WANT GRADED ON THE EXAM PAPER. Please write your name on each page you hand in. Show all your reasoning and all pertinent calculations. *Give all answers in exact form. Decimal approximations of any accuracy will not receive full credit.*

When you have finished the exam, place this cover sheet on top of it and fold the packet in half *the long way, with your name facing out.*

YOU ARE STRONGLY ENCOURAGED TO READ ALL THE PROBLEMS BEFORE BEGINNING.

Question	Points	Score
1	30	
2	30	
3	10	
4	15	
5	15	
Total:	100	

Good luck!

1. Find the general solutions to the differential equations.

(a) (15 points) $y'' + 3y' - 10y = 0$

(b) (15 points) $y'' + 6y' + 10y = 0$

2. Solve the initial value problems.

(a) (15 points) $y'' + 3y' - 10y = 0$, $y(0) = 7$, $y'(0) = -7$

(b) (15 points) $y'' + 6y' + 10y = 0$, $y(0) = 1$, $y'(0) = -4$

3. (10 points) State a condition on the functions M and N that will guarantee that the equation

$$M(x, y) + N(x, y)y' = 0$$

is exact.

4. (15 points) Use Euler's method with step size $h = 0.1$ to approximate $y(0.2)$, where y is the unique solution of the initial value problem

$$y' = 3y - ty^2, \quad y(0) = 1.$$

You may express your answer as a decimal, but keep three digits of accuracy if you do.

5. (15 points) Find a fundamental set of solutions of the differential equation $4y'' - 4y' + y = 0$. Justify your answer by computing an appropriate Wronskian.