

TEST 1

Math 271 - Differential Equations

Score: _____ out of 100

2/12/2013

Name: _____

Read all of the following information before starting the exam:

- You have 50 minutes to complete the exam.
- Show all work, clearly and in order, if you want to get full credit. Please make sure you read the directions for each problem. I reserve the right to take off points if I cannot see how you arrived at your answer (even if your final answer is correct).
- Please box/circle or otherwise indicate your final answers.
- Please keep your written answers brief; be clear and to the point. I will take points off for rambling and for incorrect or irrelevant statements.
- This test has 6 problems and is worth 100 points. It is your responsibility to make sure that you have all of the pages!
- Good luck!

1. Fill in the following table with the missing classification information:

ODE	order	linear/nonlinear
$xy''' - \sin(x)y' = x \ln(x)$		
$(xy + 2)y'' = y^5$		
$\frac{dR}{dt} = 2014R$		

2. (a) Verify that $y = Ce^{x-x^2}$ is a one-parameter general solution to the differential equation

$$y' + (2x - 1)y = 0$$

- (b) Use part (a) to find a solution to the initial value problem (IVP) consisting of the differential equation $y' + (2x - 1)y = 0$ and the initial condition $y(1) = 6$.

3. Find a solution to the following initial-value problem:

$$\frac{dy}{dx} = \frac{y^2 + 5y + 6}{\sqrt{1 - x^2}}, \quad y(0) = 2.$$

Implicit (or Explicit) Solution:

4. (a) Find an explicit solution of:

$$x \frac{dy}{dx} + y = 2x \ln(x).$$

Be sure to clearly label steps to maximize your score.

Explicit Solution:

(b) Give the largest interval over which the general solution is defined.

(c) Are there any transient terms in the general solution? If yes, what are they?

5. Find an explicit solution of:

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

Be sure to clearly label steps to maximize your score.

Explicit Solution:

6. (a) What substitution turns the Bernoulli equation $x \frac{dy}{dx} + y = x^2 y^2$ into a 1st order linear differential equation?
- (b) What substitution turns the homogeneous of degree equation $(xy + y^2)dx + x^2 dy = 0$ into a separable differential equation?
- (c) Pick one of the two differential equations above to fully solve.

I will solve the differential equation from (a) (b) (CIRCLE ONE)

Implicit (or Explicit) Solution: