

## Math 193 – Test 2: Version B

March 12, 2018

Name: \_\_\_\_\_

Instructor: Patricia Wrean

Total: 25 points

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1. (5 points) Consider the differential equation

$$x^2y'' - xy' + y = 0$$

with solution

$$y = Cx \ln x$$

- (a) State the order of this DE. \_\_\_\_\_
- (b) Is this solution a general or particular solution? \_\_\_\_\_
- (c) Show that this solution really is a solution to this DE.

Hint: Do not try to solve the DE! Just show that the above solution works.

2. (4 points) Solve, giving an explicit solution.

$$\frac{dy}{dx} - y \tan x - 5 \sec x = 0$$

3. (5 points) Solve the following differential equation.

$$y'' - 6y' = 3e^{-x} + 12$$

4. (3 points) Solve the following differential equation.

$$y'' - 6y' + 10y = 0$$

5. (3 points) Write down the DE and the initial conditions for the following system.

When a 2.45 N weight is suspended from a spring, the spring stretches by 0.07 m. There is a damping force numerically equal to three times the velocity but no external force. The weight is initially 0.10 m below the equilibrium position with an upwards velocity of 0.06 m/s.

DO NOT SOLVE THE DE!

6. (5 points) After being thrown, an 18 kg curling rock sliding along a horizontal ice surface slows down due to frictional forces which are proportional to the square of the rock's velocity. The initial speed of the rock is 2.5 m/s, and after 3 seconds, the rock has slowed to 1.2 m/s. How fast is the curling rock traveling after another 2 seconds have passed? Begin with an appropriate DE, using the fact that acceleration is the rate of change of velocity.