

## Math 252 – Test 1

February 6, 2020

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

Instructor: Patricia Wrean

**Total: 25 points**

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1. (5 points) Solve the following DE, giving an explicit solution.

$$\sin 3x dx + 2y^2 \cos^3 3x dy = 0$$

2. (5 points) Consider the following initial-value problem.

$$xy' - 2y = x^4 - \frac{1}{x^4}, \quad y(-1) = 2$$

(a) Solve this DE.

(b) State the interval of solution.

(c) Identify any transient terms in the solution.

3. (4 points) Solve the following DE.

$$\frac{dy}{dx} = -3 + \sqrt[3]{3x + y}$$

4. (5 points) Consider the following differential equation.

$$(y^2 + xy^3) dx + (y^3 e^{-2y} - xy) dy = 0$$

- (a) Show that this DE is not exact in its current form.
- (b) Find an appropriate integrating factor.
- (c) Solve the DE.

5. (6 points) When a webpage is moved or deleted, any links that point to the old location are said to have “link rot”. Two computer scientists studying “link rot” found that the rate of change in the number of working links on a webpage is proportional to the number of currently working links on that page.

The researchers created a page with 510 links to science education resources in August 2000. Exactly two years later, they found that only 370 of those links were still working. If their model is accurate, how long will it take (from the original date of August 2000) for only half of the original links to still work?