

# MTH 3311 - Practice Test #1

SPRING 2017

Pat Rossi

Name \_\_\_\_\_

1. Test the First-Order, Linear Differential Equation for exactness. If the equation is exact, find the solution.

$$(12x^3 + 4y^3) dx + (6 \cos y + 12xy^2) dy = 0$$

2. Solve the differential equation  $\frac{dy}{dx} = x^2 + \frac{x^2}{y}$ , subject to the initial condition  $y(3) = 0$  (Assume that  $y \geq 0$ )

3. Solve the differential equation  $y' - y = -x^{-3}e^x$ .

4. Solve the differential equation  $(xy + 4y^2 + 9x^2) dx - x^2 dy = 0$

5. Test the First-Order, Linear Differential Equation for exactness. If the equation is exact, find the solution.

$$(16x^3y^2 + 12xy^2) dx + (8yx^4 + 12yx^2 - 3e^{-y}) dy = 0$$

6. Solve the differential equation  $\frac{dy}{dx} = \frac{x+2}{y^2}$ , subject to the initial condition  $y(2) = 3$

7. Solve the differential equation  $y' + \cot(x)y = x$  (Assume that  $0 < x < \frac{\pi}{2}$ )

8. Solve the differential equation  $(xe^{\frac{y}{x}} - y) dx = -x dy$

9. Test the First-Order, Linear Differential Equation for exactness. If the equation is exact, find the solution.

$$(4x^3y^2 + 2xy^2) dx + (8x^4 + 12x^2) dy = 0$$

10. Solve the differential equation  $\frac{dy}{dx} = \frac{2y+1}{x-3}$ , subject to the initial condition  $y(4) = 1$  (Assume that  $x, y > 0$ )

11. Solve the differential equation  $xy' + y = x^4 + x^2$  (Assume that  $x > 0$ )

12. Solve the differential equation  $xy dx - (x^2 - y^2) dy = 0$  (Assume that  $x, y > 0$ )

13. Test the First-Order, Linear Differential Equation for exactness. If the equation is exact, find the solution.

$$(\cos(x) + 3ye^{xy}) dx + (\tan^2(y) + 3xe^{xy} + 1) dy = 0$$

14. Solve the differential equation  $\frac{dy}{dx} = x - xy - y + 1$ . (Assume that  $y > 1$ )

15. Solve the differential equation  $\cos(x)y' + y = 10$  Assume that  $0 < x < \frac{\pi}{2}$

16. Solve the differential equation  $(x^3 + y^3) dx - xy^2 dy = 0$ ;  $y(1) = 0$  (Assume that  $x > 0$ )