Review

1. Solve the initial value problem

$$y' = x^2y + 2xy + 2y, y(0) = 3.$$

2. Solve the differential equation

$$\frac{dy}{dx} = 2xe^{x^2+y}.$$

3. Solve the initial value problem

$$y' + 3y = 4, \quad y(0) = 5.$$

4. Solve the differential equation

$$y' + \frac{1}{t+1}y = 1, \quad y(0) = 0.$$

5. Solve the initial value problem

$$y' - y\tan t = \sec t, \quad y(\pi/4) = 1.$$

6. Solve the initial value problem

$$ty' + 2y = 4t^2, \quad y(1) = 2.$$

7. For the following differential equation determine if it is exact or not. If it is not exact, see if you can find an integrating factor, then solve it.

$$\frac{dy}{dx} = \frac{9x^2 - 2xy}{x^2 + 2y + 1}.$$

8. For the following differential equation determine if it is exact or not. If it is not exact, see if you can find an integrating factor, then solve it.

$$(3x^2y + 2xy + y^3)dx + (x^2 + y^2)dy = 0.$$

9. For the following differential equation determine if it is exact or not. If it is not exact, see if you can find an integrating factor, then solve it.

$$\frac{x^2 + y^2}{x+1}dx + 2ydy = 0.$$

10. For the following differential equation determine if it is exact or not. If it is not exact, see if you can find an integrating factor, then solve it.

$$2xy^2 + 4 = (6 - 2x^2y)y'$$

11. A national park has a population of 5000 deer in the year 2016. Conservationists are concerned because the deer population is decreasing at the rate of 7% per year. If the population continues to decrease at this rate, how long will it take until the population is only 3000 deer?

12. You deposit \$2400 in a bank account with an annual interest rate of 1.2%. Find the amount that you have in your account after 4 years.

13. Suppose that a cup of coffee obeys Newton's law of cooling. If the coffee has a temperature of 85° C and the room temperature is 22° C and after five minutes the coffee has temperature 50° C, find how long will it take for the coffee to reach the temperature of 40° F.