Math 2233
Homework Set 2

1. Solve the following differential equation using Separation of Variables.

$$\frac{dy}{dx} = xe^y$$

2. Solve the following differential equation using Separation of Variables.

$$\frac{dx}{dt} = txe^{t^2}$$

3. Solve the following differential equation using Separation of Variables.

$$x^2y' + e^y = 0$$

4. Solve the following differential equation using Separation of Variables.

$$yy' = e^x$$

5. Determine the order of the following differential equations and whether or not the equations are linear.

(a) $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + 2y = \sin(x)$

(b) $(1+y^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = e^x$

(c) $\frac{d^4y}{dx^4} + \frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 1$

(d) $\frac{dy}{dx} + xy^2 = 0$

(e) $\frac{d^2y}{dx^2} + \sin(x+y) = \sin(x)$

6. Solve

(a) $y' + 3y = x + e^{-2x}$

(b) $y' - y = 2c^x$

(c) $xy' + 2y = \sin(x) \quad ; \quad x > 0$

7. Solve the following initial value problem.

$$y' - y = 2xe^{2x} \ ; \ y(1) = 0 \ .$$

8. Solve the following initial value problem.

$$y' + \frac{2}{x}y = \frac{\cos(x)}{x^2} \ ; \ y(\pi) = 0$$

9. Find the solution of the initial value problem below. State the interval in which the solution is valid.

$$xy' + 2y = x^2 - x + 1 \ ; \ y(1) = \frac{1}{2} \ .$$

10. Find the solution of the initial value problem below. State the interval in which the solution is valid.

$$y' + y = \frac{1}{1+x^2} \quad , \quad y(0) = 0 \quad .$$