Homework 2

1. Solve the differential equations

$$\frac{dy}{dx} + y = e^{3x}$$
$$x\frac{dy}{dx} - y = x^2 \sin x$$
$$y' \cos x + (\sin x)y = 1.$$

2. Solve the initial value problems

$$xy' + y = e^x, \quad y(1) = 2$$
$$y' - (\sin x)y = 2 \sin x, \quad y(\pi/2) = 1.$$

3. Determine if the following equations are exact; solve the exact ones

$$(2x - 1)dx + (3y + 7)dy = 0$$
$$(2xy^2 - 3)dx + (2x^2y + 4)dy = 0$$
$$x\frac{dy}{dx} = 2xy^2 - y + 6x^2$$
$$(5y - 2x)y' - 2y = 0$$

4. Solve the initial value problems

$$(x + y)^2 dx + (2xy + x^2 - 1)dy = 0, \quad y(1) = 1$$
$$(4y + 2t - 5)dt + (6y + 4t - 1)dy = 0, \quad y(-1) = 2$$

5. Find integrating factors for

$$(2y^2 + 3x)dx + 2xydy = 0$$
$$6xydx + (4y + 9x^2)dy = 0$$

   then solve.