Homework 1

1. Solve the differential equations

$$y' + 3y = t + e^{-2t},$$
$$y' + y = 5\sin(2t).$$

2. Solve the initial value problems

$$y' + \frac{2}{t}y = \frac{\cos t}{t^2}, \quad y(\pi) = 0, \quad t > 0,$$
$$ty' + (t+1)y = 2te^{-t}, \quad y(1) = 3, \quad t > 0.$$
$$ty' + y = e^t, \quad y(1) = 2.$$

3. Solve the differential equations

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

4. Solve the intial value problems

$$y' = (1-2x)y^2, \quad y(0) = -\frac{1}{6},$$
$$xdx + ye^{-x}dy = 0, \quad y(0) = 1,$$
$$y' = \frac{3x^2 - e^x}{2y-5}, \quad y(0) = 1.$$