1. (15%) Solve $2x - y \sin(xy) + (3y^2 - x \sin(xy))y' = 0$

2. (15%) Solve $y' + \frac{2}{x+1}y = 3; \quad y(0) = 5$

3. (15%) Solve $y'' - 3y' = 2e^{2x}\sin(x); \quad y(0) = 1, \quad y'(0) = 2$

4. (20%) Solve the differential equation with the hint.
   
   $4x^2y'' + 8xy' + (4x^2 - 35)y = 0; \quad u = y\sqrt{x}$

5. (20%) A 400-L tank initially contains 200 liter of NaOH solution in which 10 kg of NaOH have been dissolved. Beginning at time zero, a NaOH solution containing 1 kg of NaOH per liter is added at the rate of 10 liter per minute, and a different stream containing pure water only is also added at the rate of 10 liter per minute. Meanwhile, another stream is poured out of the tank at the rate of 20 liter per minute. At just four minutes after time zero, 20 kg of pure NaOH is dumped into tank at the moment. Determine how much NaOH is in the tank at any time?

6. (15%) Find the temperature distribution in a thin and homogeneous bar of length 25 cm has both insulated ends and initial temperature is 315 K. Assume one dimensional heat transfer and the heat coefficient $k$ equals to 0.01 with suitable unit.