Math 250 Exam 1 Review Problems

You are responsible for any problem like that in the homework. However, here are some problems that you should be able to complete in class. If you run out of time in class today, work on your speed this week.

1. Find an explicit solution to the differential equation \((1 - x^2)y' + xe^{-y} = 0\).

2. Solve the differential equation \((\sin y - x/y)y' = 1\).
   You may leave your solution in implicit form.

3. Solve the differential equation \((1 + y^2)dx + (2xy + y + 2)dy = 0\).

4. (a) Using two steps of the Euler Method, find an approximation to the solution of \(y' + 2y = x, y(0) = -4\) at \(x = 2\).
   (b) Find the exact solution \(\phi\) to the IVP above and determine the error in your numerical approximation of \(\phi(2)\).

5. Set up BUT DO NOT SOLVE an initial value problem that can be used to answer the following question:

A tank contains 50 gallons of solution composed of 90% water and 10% alcohol. A second solution containing 50% alcohol is added to the tank at the rate of 4 gallons per minute. As the second solution is being added, the tank is being drained at the rate of 5 gallons per minute. Assuming the solution in the tank is well stirred, how much alcohol is in the tank after 10 minutes?

DO NOT SOLVE!!!!!

6. Set up BUT DO NOT SOLVE an initial value problem that can be used to answer the following question:

A liver procured from a donor in California is packed in 30° ice for shipment to Pittsburgh for transplantation. Assuming the temperature of the liver was initially 98.6°F and 50° one hour after procurement, what will its temperature be 5 hours after procurement when it arrives in Pittsburgh?

DO NOT SOLVE!!!!!