PRACTICE EXAM 3 - MATH 152
DATE: Tuesday, November 9
INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 3 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.
GOOD LUCK!!

1. Solve the differential equation $y' + y = \cos(e^x)$ by the method integrating factors.

2. Solve the differential equation $e^{-y} \sin x - y' \cos^2 x = 0$ by separation of variables.

3. At time $t = 0$, a tank contains 25 ounces of salt dissolved in 50 gallons of water. Then brine containing 4 ounces of salt per gallon of brine is allowed to enter the tank at a rate of 2 gallons per minute and the mixed solution is drained from the tank at the same rate. How much salt is in the tank at an arbitrary time t?

4. Suppose that the town of Grayrock had a population of 10,000 in 1987 and a population of 12,000 in 1997. Assuming an exponential growth model, in what year will the population reach 20,000?

5. Find the general solution of the differetnial equation

$$\frac{d^2y}{dx} - 4\frac{dy}{dx} + 13y = 0.$$

6. Solve the inital value problem

$$y'' - 6y' - 7y = 0; \quad y(0) = 5, \quad y'(0) = 3.$$