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 $y' + 5y = \sin(e^x)$ by the method integrating factors.

2. Solve the differential equation $\frac{dy}{dx} - \frac{y^2 - y}{\sin x} = 0$ by separation of variables.

3. Consider a tank of capacity 100 gallons containing 10 pounds of salt dissolved in 50 gallons of water. At time $t = 0$ pure water is allowed to enter the tank at a rate of 5 gallons per minute and the mixed solution is drained from the tank at the rate of 3 gallons per minute. How much salt is in the tank when it reaches the time of overflowing?

4. Suppose that 100 fruit flies are placed in a container that can support at most 5000 flies. Assuming that the population grows exponentially at a rate of 2% per day, how long will it take for the container to reach capacity?

5. Find the general solution of the differetnial equation

$$\frac{d^2 y}{dx} + 4\frac{dy}{dx} + 5y = 0.$$

6. Solve the inital value problem

$$y'' - 10y' + 25y = 0; \quad y(0) = 1, \quad y'(0) = 11.$$