

Homework 4 - Math 243

Name: _____

Solve the following initial value problems using the integrating factors method.

1. $\frac{dx}{dt} + 2tx = 4e^{-t^2}, x(0) = 5.$

2. $\frac{dy}{dt} + \frac{y}{t+1} = 2, y(0) = 3.$

Need some questions about systems of equations!

3. Consider the differential equation $\frac{dv}{dt} + 4v = e^{-t}$.

(a) What is the corresponding homogeneous differential equation?

(b) What is the solution of the homogeneous differential equation?

(c) Find one particular solution for the original equation. Then combine the particular solution and the homogeneous solution to express the general solution.

4. A 30-gallon tank initially contains 10 gallons of water and 4 pounds of dissolved salt. A concentrated salt water solution containing 1 pound of salt per gallon is added to the tank at a rate of 2 gallons per minute, while a well-mixed solution is drained from the tank at a rate of 1 gallon per minute. How much salt does the tank contain when it is full?

5. Consider the differential equation $\frac{dy}{dt} + y = 6 \cos x$.

(a) Find constants A and B such that $y(t) = A \cos t + B \sin t$ is a solution to this ODE.

(b) Find the general solution of $\frac{dy}{dt} + y = 6 \cos x$.