

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 2

MATH 2260

SPRING 2019

Due: Wednesday, May 29th, 2019 at 1:00pm. SHOW ALL WORK.

1. For each of the following, state the order of the differential equation and whether it is linear or nonlinear.

(a) $t^2 \frac{d^3 y}{dt^3} - 3 \frac{dy}{dt} + \frac{y}{t^2} = 0$

(b) $y^2 \frac{d^3 y}{dt^3} - 3 \frac{dy}{dt} + \frac{y}{t^2} = 0$

(c) $\frac{d^2 y}{dt^2} - \sec(y) = 0$

(d) $\frac{dy}{dt} - \sqrt{t} \frac{d^4 y}{dt^4} = \sin(t) - 2$

2. Determine which of the following is a solution of

$$t^2 \frac{d^2 y}{dt^2} - t \frac{dy}{dt} + y = 0$$

by substituting directly into the differential equation.

(a) $y = t$

(b) $y = \ln(t)$

(c) $y = t \ln(t)$

3. Use the method of integrating factors to solve each of the following equations. When appropriate, you may assume that t is defined such that the argument of any logarithm that arises is positive.

(a) $\frac{dy}{dt} - \frac{4}{t}y = 6t$

(b) $\frac{dy}{dt} + 5y = e^{-2t}$

(c) $\tan(t) \frac{dy}{dt} + y = \tan(t)$

(d) $\frac{1}{t^2} \frac{dy}{dt} + 5t^2 y = t^2$

(e) $(t - 1) \frac{dy}{dt} + ty = 1$

4. (a) Find the particular solution of Question 3(a) given the initial condition $y(2) = 0$.

(b) Find the particular solution of Question 3(b) given the initial condition $y(0) = \frac{7}{3}$.

(c) Find the particular solution of Question 3(c) given the initial condition $y\left(\frac{\pi}{4}\right) = -1$.