

Section 1.1

1. Write a differential equation that is 4th order and nonlinear.

2. Verify that the given function is a solution of the differential equation

$$y'''' + 4y''' + 3y = t \qquad y(t) = e^{-t} + \frac{t}{3}$$

3. Find the constant r so that the function $y = e^{rt}$ is a solution to the differential equation below.

$$y''' - 3y'' + 2y' = 0$$

Section 1.2

1. The function $y = t^2 + \frac{c}{t^2}$ is a solution of the differential equation $ty' + 2y = 4t^2$. Given the initial value $y(1) = 2$, find the solution to the IVP.

2. Determine the region of the xy -plane for which the given differential equation would have a unique solution whose graph passes through a point (x_0, y_0) in the region.

$$(x^2 - 9)y' = x$$

Section 1.3

1. A tank with a capacity of 500 gal originally contains 200 gal of water with 100 lb of salt in solution. Water containing 1 lb of salt per gallon is entering at a rate of 3 gal/min, and the mixture is allowed to flow out of the tank at a rate of 2 gal/min. Find an equation for the amount of salt in the tank for any time before it starts to over flow.