Modelling with 1st Order Equations (2.3)

1. The population of mosquitoes in a certain area increases at a rate proportional to the current population, and in the absence of other factors, the population doubles each week. There are 800,000 mosquitoes in the area initially, and the predators eat 30,000 mosquitoes/day. Determine the population of mosquitoes in the area at any time.

Differences Between Linear and Nolinear Equations (2.4)

1. Determine (without solving the problem) an interval in which the solution of the given initial value problem is certain to exist.

a. $(t-3)y' + (\ln t)y = 2t,\ y(1) = 2$

b. $y' + (\tan t)y = \sin t,\ y(\pi) = 0$

2. Given the fact that $y_p = -5e^{3\sin 2x}$ is a particular solution of a homogeneous linear equation $y' = f(x)y$, can you find all solutions of this differential equation?

3. Given the fact that $y_1 = e^x$ and $y_2 = -2e^{-x}$ both satisfy the same nonhomogeneous linear equation $y' = f(x)y + p(x)$, can you find all solutions of the nonhomogeneous linear equation $y' = f(x)y + p(x)$?