

Math 256 LP 3 - 1.5 and 1.6 Linear First Order Equations and Substitution Method

1. Find general solutions of the following differential equations.

a. $(x^2 + 1)\frac{dy}{dx} + 3xy = 6x$

b. $x^2 \frac{dy}{dx} + xy = \sin(x)$

2. Assume that Lake Erie has a volume of 480 km^3 and that its rate of inflow (from Lake Huron) and outflow (to Lake Ontario) are both 350 km^3 per year. Suppose that at the time $t = 0$, the pollutant concentration of Lake Erie is five times that of Lake Huron. If the outflow henceforth is perfectly mixed lake water, how long will it take to reduce the pollution concentration in Lake Erie to twice that of Lake Huron?

3. Solve the non-linear differential equation $2xyy' = x^2 + 2y^2$ using the substitution $\nu = \frac{y}{x}$