

1. For the following functions, verify they are solutions to the differential equation

$$2y' + 3y = e^{-x}$$

(Note, the given differential equation is not separable, so you do not *solve* the differential equation.)

a)  $y = e^{-x}$

b)  $y = e^{-x} + e^{-3x/2}$

c)  $y = e^{-x} + Ce^{-3x/2}$

2. Solve the following differential equation:

$$\frac{dy}{dx} = x^2 \sqrt{y}$$

3. Solve the following differential equation:

$$\frac{dy}{dx} = 3x^2 e^{-y}$$

with the initial condition that  $y(0) = 1$ .

4. The intensity  $L(x)$  of light,  $x$  feet underwater, decreases at a rate proportional to its current intensity, meaning  $dL/dx = kL$  for some constant  $k$ . From experience you know that diving down 18 ft in the northern side of Oahu will cut the light intensity in half. You also know that if light intensity drops below 10% of the surface value, you will need artificial light. How far can you dive in the North Shore without using artificial light?