Review: Differential Equations

1. Find a general solution for $\frac{dy}{dx} = 5e^{-x/2}$.

$y = -10e^{-\frac{x}{2}} + C$

2. $\frac{dy}{dx} = x + 2y$. Using Euler's method, starting at (-3, 2) with step size Δx = 0.5, what is the approximate value of y(-2)?

3.75

3. The rate of change of N is proportional to N. When t = 0, N = 250 and when t = 1, N = 400. What is the value of N when t = 4?

1638.4

4. Find an equation for y in terms of x:

5. $\frac{dy}{dx} = 5x^2 y$; y(0) = 6

$y = 6e^{\frac{5}{3}x^3}$

6. $\frac{dy}{dx} = \frac{1}{y + x^2 y}$; y(0) = 2

$y = \sqrt{2\tan^{-1}(x) + 4}$

7. $\frac{dy}{dx} = \frac{\sin x}{\cos y}$; y(0) = 3π/2

$y = \arcsin(-\cos x)$

8. A colony of bacteria grows exponentially and the colony's population is 4,000 at time t = 0 and 6,500 at time t = 3. How big is the population at time t = 10?

20179

9. A rock is thrown upward with an initial velocity, v(t), of 18 m/s from a height, h(t), of 45 m. If the acceleration of the rock is a constant -9 m/s^2, find the height of the rock at time t = 4.

45 m

10. The rate of growth of the volume of a sphere is proportional to its volume. If the volume of the sphere is initially 36π ft^3, and expands to 90π ft^3 after 1 sec, find the volume of the sphere after 3 seconds.

1767.146 ft^3

11. Use Euler's Method, with h = 0.2, to estimate y(1) if y' = -y and y(0) = 1.

0.328

12. Sketch the slope field for dy/dx = 2x