Worksheet 5
10/5/2023

1. When an advertising campaign for a new product is introduced into a city of fixed population N, the rate of change of the number y of individuals who have heard about the product at time t is proportional to the number of individuals in the population who have not yet heard about the product. Write a differential equation for y.

2. Determine if $y = \sqrt{1 - x^2}$ is a solution of the differential equation $yy' - x = 0$.

3. Determine if $y = \sqrt{x}$ is a solution of the differential equation $xy' - y = 0$.

4. For what values of r does the function $y = e^{rx}$ satisfy the differential equation $2y'' + y' - y = 0$?

5. Solve the differential equation $xyy' = x^2 + 1$.

6. Solve the differential equation $\frac{dy}{dx} = 2x(y^2 + 1)$.