AP Calculus   Name: _____
6.3 Worksheet C | Applications of Differential Equations

Unless stated otherwise, round all answers to three decimal places. Show your work.

□1a. The rate of change of the number of geese, G, in a population is directly proportional to $900 - G$, where t is the time in years (and G is a function of t). When $t = 0$, the goose population is 400, and when $t = 2$ years, the population has increased to 700 geese. Express G as a function of t. b. How long will it take for the population to reach 800 geese?

2a. $y = 300 - 300e^{-0.405t}$ 2b. 186,629 people   3a. $y = 2 - 2e^{-0.862t}$ 3b. 1,642,988 people

☐2. A new product is introduced through an advertising campaign to a population of 300,000 potential customers. The rate at which the population hears about the product is proportional to the number of people who are not yet aware of the product. Initially no one has heard of the product, but by the end of 1 year, 100,000 people have heard of the product. Let y be the number of people who have heard of the product (in thousands). (a) Write a differential equation representing the problem, and solve it to express y as a function of t (where $t = 0$ years is when the ad campaign begins). (b) How many will have heard of the product after 2.4 years? Round to the nearest person.

☐3. A new product is introduced through an advertising campaign to a population of 2 million potential customers. The rate at which the population hears about the product is proportional to the number of people who are not yet aware of the product. Initially no one has heard of the product, but by the end of 0.5 years, 700,000 people have heard of the product. Let y be the number of people who have heard of the product (in millions). (a) Express y as a function of t (where $t = 0$ is when the ad campaign begins). (b) How many will have heard of the product after 2 years? Round to the nearest person.

1a. $G = 900 - 500e^{-0.458t}$ 1b. 3.513 years