

Show all your work. No credits for answers without work.

Problem 1: The population $x = x(t)$ of bacteria in a certain colony has a time rate of growth proportional to x itself. If the population tripled in 3 hours, what is the population of the bacteria after 6 hours if the initial population is 10?

Problem 2: Suppose that $y(x) = \frac{1}{x} + \frac{x}{c}$ is a solution to the initial value problem $y' = 1 - \frac{y}{x}$, $y(1) = y_0$.
Find y_0 .

Problem 3: Solve the initial value problem: $y \frac{dy}{dx} = e^{x-y^2}$, $y(0) = 0$.

Problem 4: Find a solution to the initial value problem: $xy' = \frac{\cos x}{x} - 2y$, $y(\pi/2) = 0$.