

I. Consider the following linear first-order differential equation:

$$xy' = (x + 1)y + 5x^3$$

Ia. Find the general solution of the above equation.

Ib. Let $y(0) = 2$. Find the corresponding particular solution.

II. A population $P(t)$ of small rodents has birth rate $\beta = (0.002)P$ (births per month per rodent) and constant death rate δ . If $P(0) = 50$ and $P'(0) = 4$, how long (in months) will it take this population to double to 100 rodents? (Suggestion: First find the value of δ)