Answer on Question #69628 – Math – Differential Equations

Question

Solve the initial value problem $y'-ay=0$, $y(x_0)=y_0$

Solution

$$y'-ay = 0, \quad (1)$$

$$y(x_0) = y_0. \quad (2)$$

Equation (1) is a first-order linear ordinary differential equation, its general solution is given by

$$y = C\cdot e^{ax}, \quad (3)$$

where C is an arbitrary real constant.

Substituting for y from (3) into (2)

$$y(x_0)= C\cdot e^{ax0} = y_0 \quad => \quad C = y_0\cdot e^{-ax0} \quad => \quad y = y_0\cdot e^{-ax0}\cdot e^{ax} = y_0\cdot e^{a(x-x0)}$$

Answer: $y = y_0\cdot e^{a(x-x0)}$.