§3.8 - Exponential Growth + Decay

Let $P(t)$ represent the population of a rabbit colony. How fast is the rabbit population increasing?

$\frac{dP}{dt} = k \cdot P(t)$, where k is a positive constant.

$\frac{dy}{dt} = y' = k \cdot y$, where k is

positive # ← natural growth

negative # ← natural decay

Qn: If something behaves according to law of natural growth or decay, what is the function itself?

If $\frac{dy}{dt} = k \cdot y \Rightarrow y = y(0) \cdot e^{kt}$

Suppose a rabbit colony grows according to the same law of natural growth, $\frac{dP}{dt} = .15 \cdot P$.

If $P(0) = 100$, find $P(10)$.

$P(t) = P(0) \cdot e^{kt} = 100 \cdot e^{.15(t)}$, $\therefore P(10) = 100 \cdot e^{.15(10)} =$

$100 \cdot e^{1.5} \approx 448$