Population model:

P(t) = population as a function of time t

$\dfrac{dP}{dt}$ = rate of growth

Important Assumption:

$\dfrac{dP}{dt}$ is proportional to P(t)
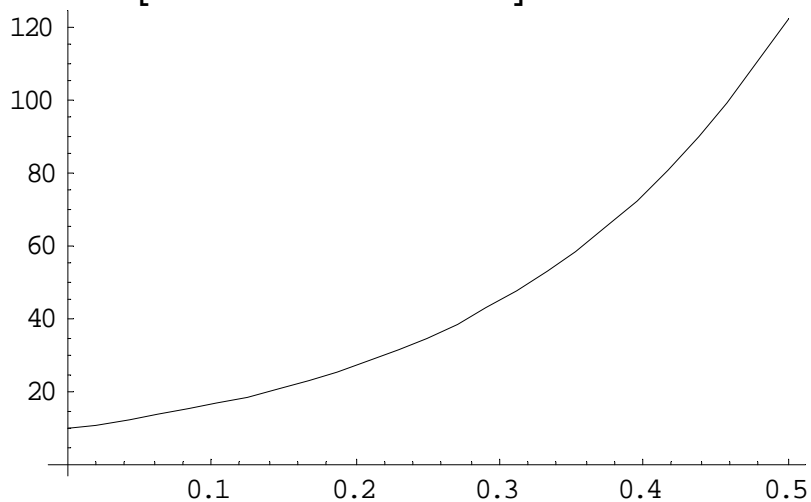
Differential Equation:

$\dfrac{dP}{dt}$ = k P(t)

Example from Mathematica:

DSolve[P'[t]==k P[t],P[t],t]
$$\{\{P[t] \rightarrow e^{kt}C[1]\}\}$$

DSolve[{P'[t]==5 P[t],P[0]==10},P[t],t]
$$\{\{P[t] \rightarrow 10\, e^{5t}\}\}$$

Plot$\left[10\, e^{5t},\ \{t,\ 0,\ 0.5\}\right]$

-Graphics-