

Introduction to Diff Eqns

(We need Int. Calc.)

what is a diff. eqn?

identity with an unknown $y(t)$ for a diff it is a function

Alg. eqns: $3x + 2 = 0$
 $x^2 + 2x - 1 = 0$

Δ the unknown $y = y(t)$ appears into the eqn with some of its derivatives $y'(t), y''(t), \dots, y^{(n)}(t)$ order of the eqn.
 $y^{(n)}(t)$ n-th deriv of y

Example (Malthus model)

Goal: describe the ^{time} evolution of a population.

$P = P(t)$ = "size" of pop at time t
 $t \in \mathbb{R}$

$t, t+h \rightsquigarrow P(t+h) - P(t)$

$\frac{P(t+h) - P(t)}{P(t)}$ var of pop over tot pop.

growth rate on $[t, t+h]$ = $\frac{P(t+h) - P(t)}{h P(t)}$
 $\downarrow h \rightarrow 0$
 $P'(t)$

instantaneous growth rate $\frac{P'(t)}{P(t)}$

Malthus: inst. growth rate is const

$\frac{P'(t)}{P(t)} = k$