SOLVING ODE'S

GENERAL SOLUTION

DEFINITION

The **General Solution** includes arbitrary constants and we use the initial conditions to determine the values of these constants.

The arbitrary constants are **constants of integration**

$$F(x) = \int f(x)dx + C$$

SOLVING ODE'S USING FTC

FTC

LEMMA

$$y'(t) = f(t)$$

$$\Rightarrow y(t) = y(t_0) + \int_{t_0}^{t} f(u)du$$

EXAMPLE

EXAMPLE

$$y'(t) = t^2$$

FREE FALL

EXAMPLE

$$\begin{cases} z''(t) & = -g \\ z(0) & = z_0 \\ z'(0) & = v_0 \end{cases}$$

Let $v = z' \ldots$

SEPARABLE ODE'S

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DEFINITION

A separable ODE is an ODE of the form

$$f(y)y' = g(t)$$

EXPONENTIAL GROWTH/DECAY

$$\begin{cases} y' & = 3y \\ y(0) & = 4 \end{cases}$$

LOGISTIC GROWTH

$$\begin{cases} p' & = 5p(3-p) \\ p(0) & = 1 \end{cases}$$

$$p(t) = \frac{5}{1+4e^{-15t}}$$