

$$y', y'', \dots, y^{(n)}$$

$$\frac{dy}{dx}, \frac{d^2y}{dx^2}, \dots, \frac{d^ny}{dx^n}$$

$$\dot{y}, \ddot{y}, \ddot{\ddot{y}}$$


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$$\frac{dy}{dt} = y - t$$

$\downarrow \quad \nearrow$   
 $t$ : independent var.  $\longleftrightarrow x$

$$y' = y \quad \left. \vphantom{y'} \right\} \frac{dx}{dt}$$

$\updownarrow y$   
 time

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$$y' = y^2 - t$$

$$ty' = y$$

$$y' + 4y = e^{-3t}$$

$$yy'' + t^2y = \cos t$$

$$y' = \cos(ty)$$


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$$y'' \quad \frac{\partial^2 \omega}{\partial t^2} = c^2 \frac{\partial^2 \omega}{\partial x^2}$$


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derivative

$$\frac{d}{dx}$$

Partial derivative

$$\left( \frac{\partial}{\partial x} \right)$$

Def

$$y' = \frac{dy}{dt} = f(t, y)$$

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

$$y^{(n)} = f(t, y, y', \dots, y^{(n-1)})$$

Solutions

→ (☺) initial value

Ex

$y = Ce^{-t^2}$  is soln  $y' = -2ty$

$$y' = -2tCe^{-t^2}$$

$$y' \stackrel{?}{=} -2ty$$

$$y' = -2t \underline{Ce^{-t^2}}$$

$$= -2ty \checkmark$$

Ex

$$y(t) = \cos t$$

$$y' = 1 + y^2 \stackrel{?}{=}$$

$$y' = -\sin t$$

$$-\sin t \neq 1 + \cos^2 t$$

if's not a solution

Ex 15-b

$$x^2 y'' - 2xy' + 2y = x^3$$

$$y = 2x + x^2$$

$$y' = 2 + 2x$$

$$y'' = 2$$

$$x^2 y'' - 2xy' + 2y = x^3$$

$$\begin{aligned} x^2(2) - 2x(2+2x) + 2(2x+x^2) &= 2x^2 - 4x - 4x^2 + 4x + 2x^2 \\ &= 0 \neq x^3 \end{aligned}$$

$y(x)$  is not a solution