Derivatives of Parametric Equations

$x(t)$ = horizontal movement wrt time

$y(t)$ = vertical movement wrt time

1st der

$$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$$

2nd deriv

$$\frac{d^2y}{dx^2} = \frac{d\left[\frac{dy}{dx}\right]}{\frac{dx}{dt}}$$

Example

$x(t) = 3t^2 + 2t$

$y(t) = 4t - 1$

$$\frac{dy}{dx} = \frac{4}{6t+2}$$

$$\frac{d^2y}{dx^2} = \frac{(6t+2)(0) - [4(6)]}{(6t+2)^2}$$

$$\frac{\qquad\qquad}{6t+2}$$