Derivatives

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How Do You Take the Derivative of an Equation?

Examples:

$$\frac{dy}{dx}x^2 = 2x$$

$$\frac{dy}{dx}x^3 = 3x^2$$

$$\frac{dy}{dx}5x^3 = 15x^2$$

The basic equation used to find the derivative of a function is this:

$$\frac{d}{dx}\,x^n = nx^{n-1}$$

What is the Significance of Derivatives?

Derivatives allow us to measure the slope of a certain point on a graph. Also, derivatives allow us to represent relations between a position, velocity and acceleration function. For example we are given a position function and from that position function we need to find what the velocity and acceleration is at a specific time. When we take the derivative of the position function, we get the velocity function, and from the velocity function we could obtain the acceleration function by deriving the velocity function.

Example: What is the velocity and acceleration of the ball at t=3s with a position function of

y=x^3

$$\frac{dy}{dx}x\left(t\right)=v\left(t\right) \qquad \frac{dy}{dx}x^3=3x^2$$

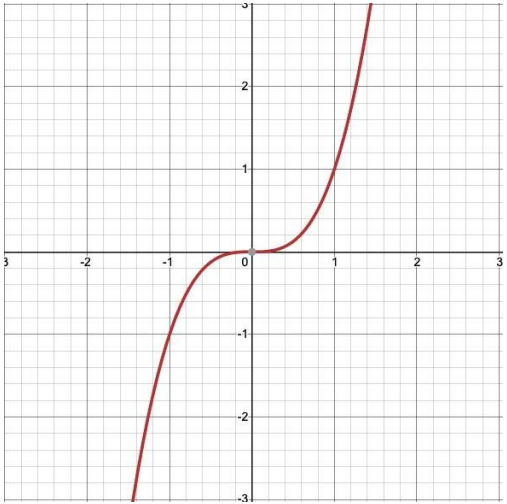
At x=t=3s the velocity=3(3^2), so v=27m/s

$$\frac{dy}{dx}v\left(t\right)=a\left(t\right) \qquad \frac{dy}{dx}3x^2=6x$$

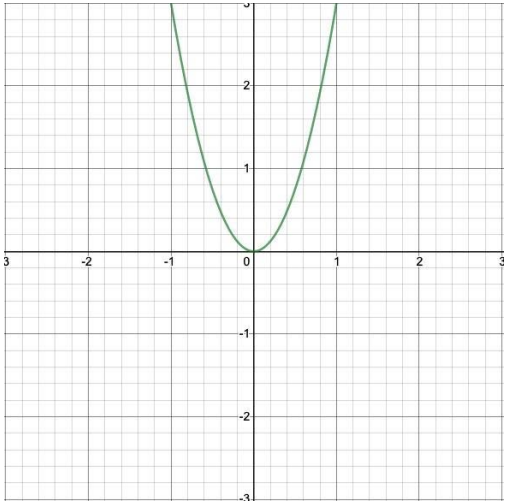
At x=t=3s the acceleration=6(3), $a=18m/s^2$

Derivative Graphs

Position



Velocity



Acceleration