

## 1 | Derivatives

=> Instantaneous rate of change at a particular point

- Average rate of change =  $\frac{\Delta Y}{\Delta X}$

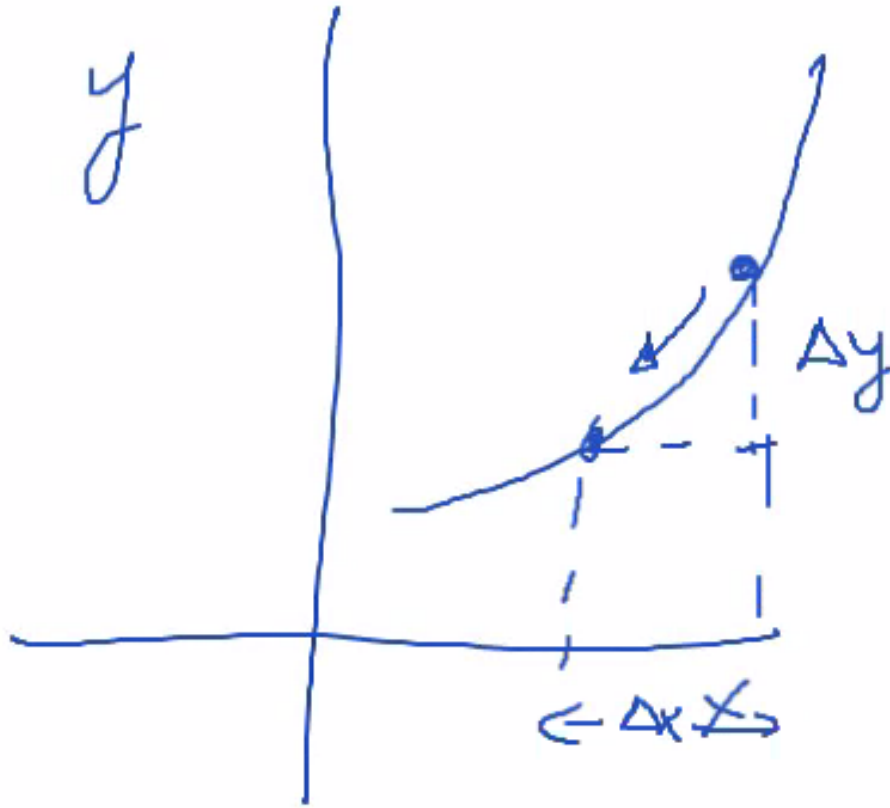


Figure 1: rateofchange.png

- Instantaneous rate of change =  $\lim_{\Delta x \rightarrow 0} \frac{\Delta Y}{\Delta X}$

Derivative of  $f(x) \Rightarrow \frac{dy}{dx}$

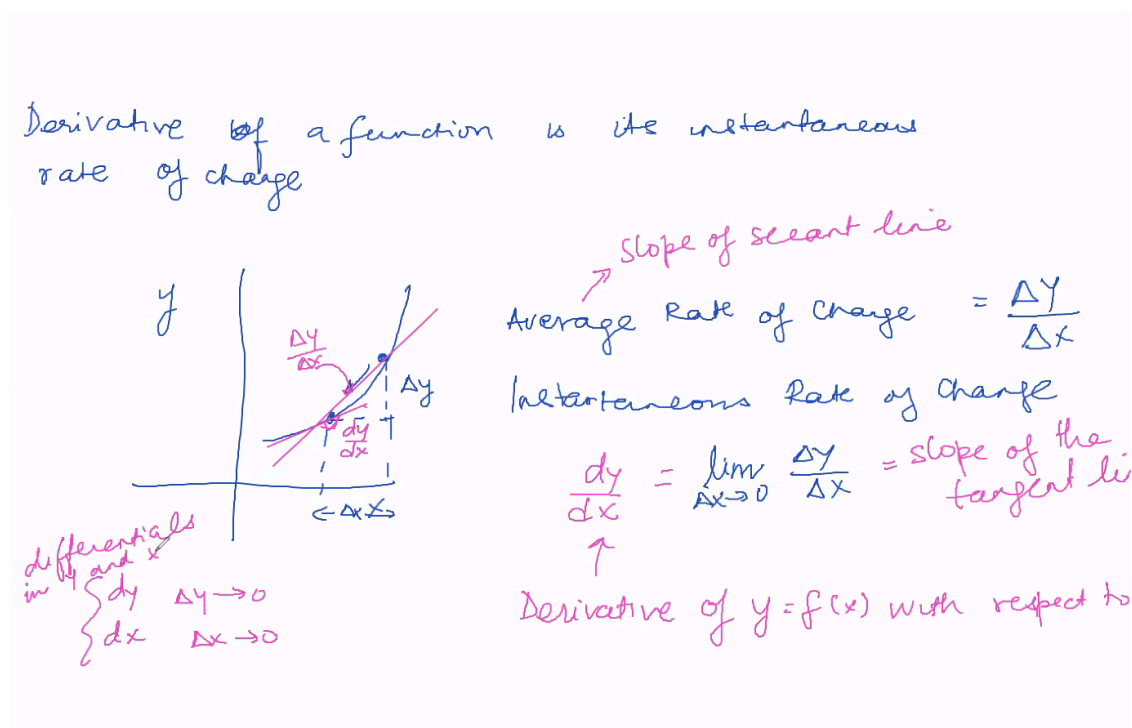


Figure 2: derivativesWB.png

## 1.1 | Useful Table of Derivatives

$f(x)$	$f'(x)$
$x^2$	$2x$
$x^3$	$3x^2$
$x^n$	$nx^{n-1}$
$\frac{1}{x}$	$-\frac{1}{x^2}$
$\sqrt{x}$	$\frac{1}{2\sqrt{x}}$
$\sin(x)$	$\cos(x)$
$\cos(x)$	$-\sin(x)$
$\tan(x)$	$1 + \tan^2(x) = \sec^2(x)$
$\cot(x)$	$-\csc^2(x)$
$\sec(x)$	$\tan(x) \sec(x)$
$\csc(x)$	$-\cot(x) \csc(x)$
$e^x$	$e^x$
$\ln(x)$	$\frac{1}{x}$
$a^x$	$a^x \ln(a)$
$\log_a(x)$	$\frac{1}{x \ln(a)}$
$f^{-1}(x)$	$\frac{1}{f'(f^{-1}(x))}$
$\sin^{-1}(ax)$	$\frac{1}{\sqrt{1-(ax)^2}}$
$\cos^{-1}(ax)$	$\frac{-1}{\sqrt{1-(ax)^2}}$
$\tan^{-1}(ax)$	$\frac{1}{1+(ax)^2}$