

Unit: An Introduction to Derivatives

Module: Understanding the Derivative

Differentiability

key concepts:

- Sometimes the **derivative** of a function is not defined. This may happen because the function is discontinuous or because it makes a sharp turn.
- If a function is **differentiable**, then it is **continuous**.

Differentiability

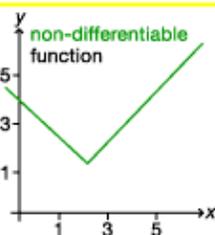
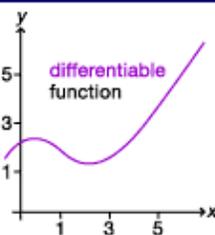
If the **derivative** of a function exists, then the function is **differentiable**.

Differentiable functions are very smooth.

A function is **differentiable** if you can compute its **derivative**.

$$f'(x) = \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$$

Examples:



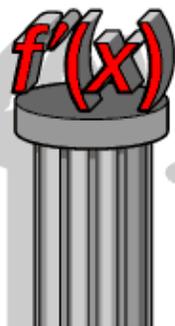
Differentiability refers to the existence of a derivative.

A function is said to be **differentiable** if its derivative exists for all points in its domain. The graph of a differentiable function is smooth.

Some functions may not be differentiable everywhere. A function is **differentiable at a point** x if the derivative exists at x . A function is **differentiable on an open interval** (a, b) if the derivative exists at every point in the interval.

If a function is not differentiable at every point, then its graph may be broken, or may have sharp turns or other irregularities.

Differentiability



Because of its power and flexibility, many mathematicians rank the derivative as one of humanity's greatest achievements.