

1 3.1: The Derivative

Now that we can find the slope of the line tangent to a curve at any point (provided the limit of the slope exists), we can talk about a new function based on this calculation.

Definition: The **derivative function** of a function f (or the **derivative** of f) is a function defined

by

$$f'(x) =$$

When is f not **differentiable**? (i.e., when does $f'(x)$ not exist or when is x not in the domain of f' ?)

Examples:

Let $f(x) = \frac{8}{x+2}$. Find $f'(x)$ and use it to determine the slope of the line tangent to f at the point where $x = 0$, $x = 2$ and $x = -1$.

A clock has a radius of 10 cm. Let $f(t)$ be the horizontal position of the tip of the second hand (where $f(t) = 0$ refers to the diameter through the 12 and 6). Sketch a rough graph of $f(t)$, then sketch the graph of $f'(t)$.

On Your Own: Determine whether $f(x) = |x^2 - 9|$ is differentiable at $x = 3$.

No; left hand limit = -6 ; right hand limit = 6 .