# Equation of a Tangent Line

9/30

ES: What is the process of finding the equation of the tangent line at a given point?

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**What is a derivative?**

The derivative of $f$ at $x$ is the slope of a tangent line at $x$.

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}, \quad \text{for all } x \text{ where the limit exist.}$$

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**other names**

- Instantaneous rate of change
- Rate of change
- Slope

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**notation for derivative**

$f'(x)$ $\quad y'$ $\quad \frac{dy}{dx}$ $\quad \frac{d}{dx}[f(x)]$

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The process of finding the derivative function is called differentiation.

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**EX** Find the Eq. of a tangent line

$f(x) = x^2 + 2 \quad (1, 3)$

$x_1 \quad y_1$

Point slope form $y - y_1 = m(x - x_1)$

$f'(x) = 2x$ from ex2 9/26 notes

$f'(1) = 2(1)$

$m = 2$

$y - 3 = 2(x - 1)$

$y - 3 = 2x - 2$

at $x=1$ eq of the tangent line $\boxed{y = 2x + 1}$