

§ 2.7 - Derivatives + Rates of Change, Part 2

In this video, we will:

- Find the equation of a line tangent to the graph of a function at a point.

Find the equation of the line tangent to $f(x) = x^2 - x$ at $x = 3$.

Formulas for a line:

- Slope - Intercept $\rightarrow y = mx + b$, $m = \text{slope}$, $b = y\text{-int}$
- point - slope $\rightarrow y - y_0 = m(x - x_0)$, $m = \text{slope}$, $(x_0, y_0) = \text{point on graph}$

$$x_0 = 3 \Rightarrow y_0 = f(3) = 9 - 3 = 6 \Rightarrow (x_0, y_0) = (3, 6)$$

$$m = \text{slope} \rightarrow f'(3) = \lim_{x \rightarrow 3} \frac{f(x) - f(3)}{x - 3} = \lim_{x \rightarrow 3} \frac{x^2 - x - 6}{x - 3}$$

$$= \lim_{x \rightarrow 3} \frac{\cancel{(x-3)}(x+2)}{\cancel{x-3}} = \lim_{x \rightarrow 3} x + 2 = \boxed{5}$$

$$y - 6 = 5(x - 3)$$

$$y - 6 = 5x - 15$$

$$y = 5x - 9$$