The Derivative

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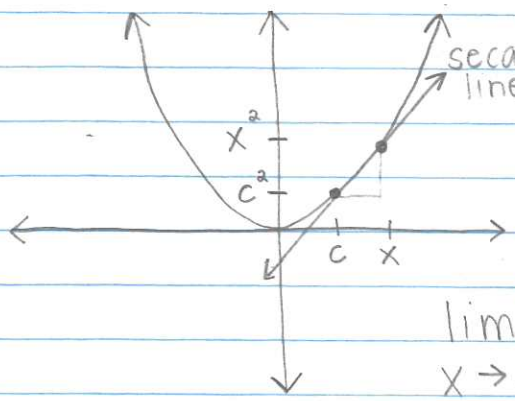


$f(x) = x^2$ rule $\boxed{m = 2x}$

$m = \frac{x^2 - c^2}{x - c}$ secant slope

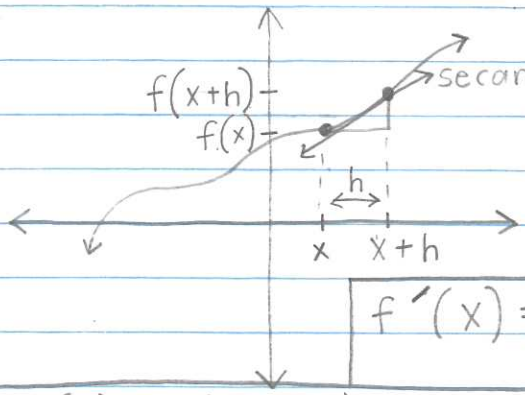
tangent slope

$\lim_{x \to c} m = \lim_{x \to c} \frac{(x+c)(x-c)}{x-c}$

$\boxed{c + c = 2c}$

slope → derivative

slope of the tangent line at $x = 3$, $= 6$: $f'(3) = 6$



$f(x)$

$m = \frac{f(x+h) - f(x)}{(x+h) - x}$

The Derivative

$\boxed{f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}}$

$f(x) = x^2$ $f(x) = 5x^2 - 4x + 2$

$f'(x) = 2x$ $f'(x) = 10x - 4$

$f(x) = 5x^2 - 4x + 2$

$f(x+h) = 5(x+h)^2 - 4(x+h) + 2$

$f'(x) = \lim_{h \to 0} \frac{5(x+h)^2 - 4(x+h) + 2 - (5x^2 - 4x + 2)}{h}$

$\frac{5x^2 + 10xh + 5h^2 + 2 - 4x - 4h + -5x^2 + 4x - 2}{h}$

DIM

$\lim_{h \to 0} \frac{h(10x + 5h - 4)}{h} = 10x - 4$