3-11-14

3° Trig

Derivatives

① $f(x) = 8x^4 + 3x^3 - x^2 - 10$

$f'(x) = 32x^3 + 9x^2 - 2x$

② $f(x) = -6x^{-2} + 5x^{-10}$

$f'(x) = 12x^{-3} - 50x^{-11}$

$= \frac{12}{x^3} - \frac{50}{x^{11}}$

③ $f(x) = \frac{2}{x^4} + \frac{3}{x^6}$

$= 2x^{-4} + 3x^{-6}$

$f'(x) = -8x^{-5} - 18x^{-7}$

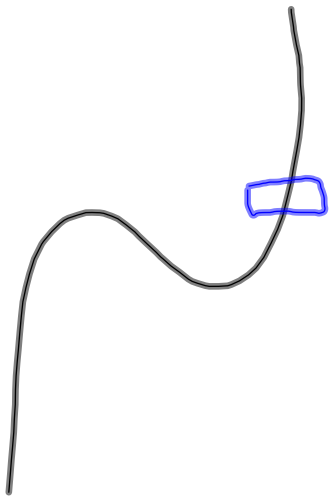
$= \frac{-8}{x^5} - \frac{18}{x^7}$

④ $f(x) = \frac{x^3}{4}$

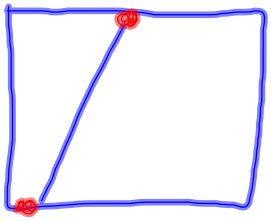
$= \frac{1}{4}x^3$

$f'(x) = \frac{3}{4}x^2 = \frac{3x^2}{4}$

$f(x) = 2x^3 - 1$



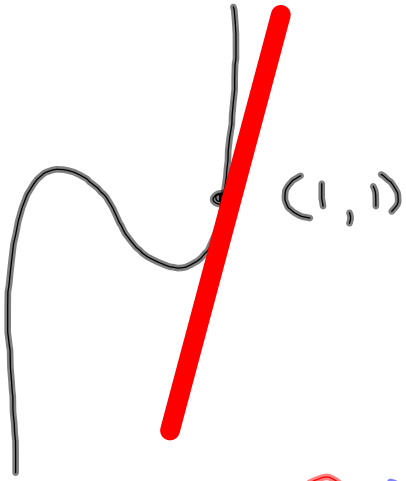
Million times



Slope

Derivative gives us the equation that will tell us the slope at any particular point on the original equation.

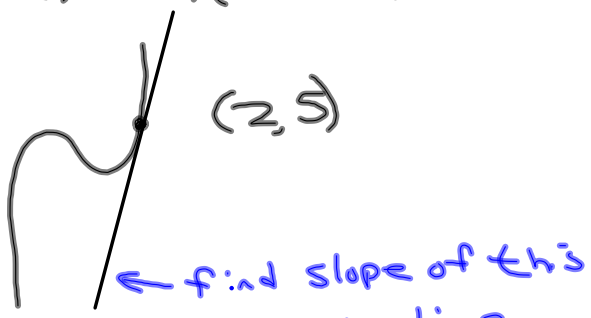
$f(x) = 2x^3 - 1$



$f'(x) = 6x^2$ (1, 1)

$= 6 \cdot 1^2 = 6$ ← Slope of tangent line

$f(x) = x^3 - 2x + 1$



$f'(x) = 3x^2 - 2$

$f'(2) = 3 \cdot 2^2 - 2 = 10$

Slope is 10.

$f(x) = x^4 - x^3 + 3$

Find slope of the tangent line at $(1,3)$

$f'(x) = 4x^3 - 3x^2$

$f'(1) = 4 \cdot 1^3 - 3 \cdot 1^2 = 1$

Slope of tangent line is 1.

$f(x) = x^{-3}$ at $\left(2, \frac{1}{8}\right)$

$f'(x) = -3x^{-4}$

$f'(2) = -3 \cdot 2^{-4}$

$= \frac{-3}{2^4} = \frac{-3}{16}$

Slope of tangent line is $\frac{-3}{16}$

$$f(x) = \frac{2}{x} \quad \text{at } (1,2)$$

$$f(x) = 2x^{-1}$$

$$f'(x) = -2x^{-2}$$

$$= \frac{-2}{x^2}$$

$$f'(1) = \frac{-2}{1^2} = -2$$

3-11-14

4th Trig

Derivatives

① $f(x) = x^4 + 2x^2 - 10x + 4$

$f'(x) = 4x^3 + 4x - 10$

② $f(x) = -5x^{-2} + 6x^{-10}$

$f'(x) = 10x^{-3} - 60x^{-11}$

$= \frac{10}{x^3} - \frac{60}{x^{11}}$

③ $f(x) = \frac{2}{x^4} + \frac{5}{x^5}$

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

$f'(x) = -8x^{-5} - 25x^{-6}$

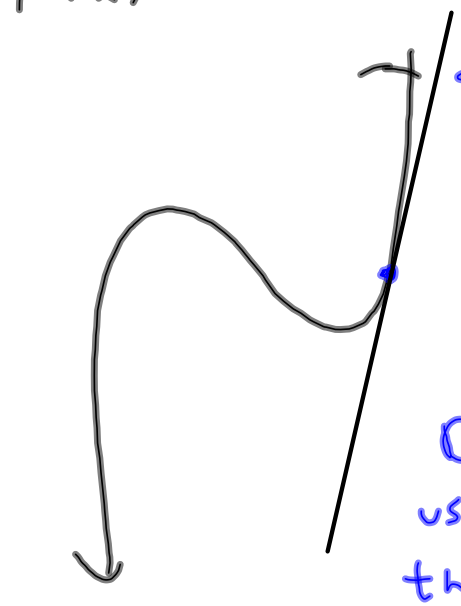
$= \frac{-8}{x^5} - \frac{25}{x^6}$

④ $f(x) = \frac{x^3}{5}$

$= \frac{1}{5}x^3$ $\quad \frac{1}{5} \cdot \frac{3}{1} = \frac{3}{5}$

$f'(x) = \frac{3}{5}x^2 = \frac{3x^2}{5}$

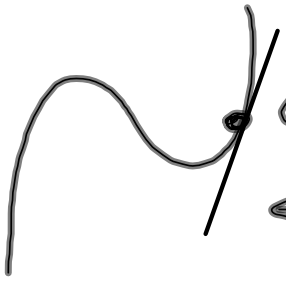
$f(x) = x^3 + 5$



← tangent line

Derivative tells use the equation that gives us the slope at any point on the original line

$f(x) = x^3 + 5$



(2, 13)

← Find slope of this tangent line

$f'(x) = 3x^2$

$f'(2) = 3 \cdot 2^2 = \boxed{12}$

slope of the tangent line

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

Find slope of the tangent line at $(1, -8)$

$f'(x) = 8x^3 - 10$

$f'(1) = 8 \cdot 1^3 - 10 = \boxed{-2}$

$f(x) = \frac{2}{x}$ at $(1, 2)$

$= 2x^{-1}$

$f'(x) = -2x^{-2}$

$= \frac{-2}{x^2}$

$f'(1) = \frac{-2}{1^2} = \boxed{-2}$

$f(x) = 3x^5 - 2x^2 + 1$

at $(1, 2)$

What is slope of the tangent line?

$f'(x) = 15x^4 - 4x$

$f'(1) = 15 \cdot 1^4 - 4 \cdot 1 = \boxed{11}$