Recall: $f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x)-f(x)}{\Delta x}$

$f'(x)$ gives the slope of the curve

$f'(x)$ gives the slope of the tangent line

Ex: $f(x) = 3x + 1$

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

Ex: $f(x) = \text{mx} + \text{b}$

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

Ex: $f(x) = x^2$

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

| $f(x)$ | $f'(x)$ |
|---|---|
| | |
| $x$ | |
| $x^2$ | |
| | |
| | |
| | |

Example 1: $f(x) = x^{162}$

Example 2: $\frac{d}{dx}(x^{23})$

Example 3: $f(x) = \sqrt{x}$

Example 4: $\frac{dy}{dx}\left(\frac{1}{x}\right) =$

Recall: $f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x)-f(x)}{\Delta x}$

Ex: $f(x) = x^2 + x$

$\frac{d}{dx}(x^2) =$

$\frac{d}{dx}(x) =$

$\frac{d}{dx}(x^2 + x) =$

$f(x) = g(x) + h(x)$

$f'(x) =$

Back to Example: $f(x) = x^2 + x$

$\frac{d}{dx}(x^2 + x) =$

Example 2:

$\frac{d}{dx}(x^3 + x^{162}) =$

Example 3:

$\frac{d}{dx}\left(x^3 + \frac{1}{\sqrt{x}}\right) =$

Ex: $f(x) = 2x^2$

$f'(x) = \frac{d}{dx}(2x^2)$

$= \frac{d}{dx}(x^2 + x^2)$

Ex: $f(x) = 3x^2$

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

$= \frac{d}{dx}(x^2 + x^2 + x^2)$

Ex: $f(x) = 162x^2$

$f'(x) = \frac{d}{dx}(162x^2)$

Recall: $f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x)-f(x)}{\Delta x}$

$\big(c \cdot f(x)\big)' =$

$$\big(c \cdot f(x)\big)' =$$

Back to Ex: $f(x) = 162x^2$

$f'(x) =$

Example 2:

$(32x^{12})'$

# Polynomials

Example 1: $f(x) = 2x^3 - 4x^2 + x + 5$

$f'(x) =$

Example 2: $f(x) = x^{12} + 2x^3 - x + 1$

$f'(x) =$

Example 3: $f(x) = -3x^3 + 2x^2 - 4$

$f'(x) =$