Recall: $f '\left(x\right)= \lim\_{∆x\to 0}\frac{f\left(x+∆x\right)-f(x)}{∆x}$

$f '\left(x\right)$ gives the slope of the curve

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

Ex: $f(x) =3x+1$

$$f '\left(x\right)= \lim\_{∆x\to 0}\frac{f\left(x+∆x\right)-f(x)}{∆x}$$

Ex: $f\left(x\right)=mx+b$

 $f '\left(x\right)= \lim\_{∆x\to 0}\frac{f\left(x+∆x\right)-f(x)}{∆x}$

Ex: $f\left(x\right)=x^{2}  $

 $f '\left(x\right)= \lim\_{∆x\to 0}\frac{f\left(x+∆x\right)-f(x)}{∆x}$

|  |  |
| --- | --- |
| $$f\left(x\right)$$ | $$f^{'}\left(x\right)$$ |
|  |  |
| $$x$$ |  |
| $$x^{2}$$ |  |
|  |  |
|  |  |
|  |  |

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

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

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

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

Recall: $ f'\left(x\right)= \lim\_{∆x\to 0}\frac{f\left(x+∆x\right)-f(x)}{∆x}$

Ex: $f\left(x\right)=x^{2}+x$

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

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

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

$f\left(x\right)=g\left(x\right)+h(x)$

$f'\left(x\right)= $

Back to Example: $f\left(x\right)=x^{2}+x$

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

Example 2:

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

Example 3:

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

Ex: $f\left(x\right)=2x^{2}$

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

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

Ex: $f\left(x\right)=3x^{2}$

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

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

Ex: $f\left(x\right)=162x^{2}$

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

Recall: $ f'\left(x\right)= \lim\_{∆x\to 0}\frac{f\left(x+∆x\right)-f(x)}{∆x}$

$\left(c∙f\left(x\right)\right)^{'}=$

$$\left(c∙f\left(x\right)\right)^{'}=$$

Back to Ex: $f\left(x\right)=162x^{2}$

$f^{'}\left(x\right)=$

Example 2:

$(32x^{12})'$

Polynomials

Example 1: $f\left(x\right)=2x^{3}-4x^{2}+x+5$

$f^{'}\left(x\right)=$

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

$f^{'}\left(x\right)=$

Example 3: $f\left(x\right)=-3x^{3}+2x^{2}-4$

$f^{'}\left(x\right)=$