

1 Derivatives

Power Rule: $x^n \rightarrow nx^{n-1}$

Chain Rule: $f^n \rightarrow nf^{n-1} \cdot f'$

Addition: $f + g \rightarrow f' + g'$

Division: $\frac{g}{f} \rightarrow \frac{f \cdot g' - g \cdot f'}{f^2}$

$$\frac{1}{f} \rightarrow \frac{-f'}{f^2}$$

Multiplication: $f \cdot g \rightarrow f \cdot g' + g \cdot f'$

$$f \cdot g \cdot h \dots \rightarrow f' \cdot g \cdot h \dots + f \cdot g' \cdot h \dots + f \cdot g \cdot h' \dots$$

Inverse: $f'(h) \rightarrow \frac{h'}{g'(f(h))}$ where g and f are inverses

Exponentials: $n^f \rightarrow f' \cdot \ln(n) \cdot n^f$

$$f^g \rightarrow f^g \left(g \cdot \frac{f'}{f} + g' \cdot \ln(f) \right)$$

Logarithms: $\log_b(x^n) \rightarrow \frac{n}{x \cdot \ln b}$

$$\log_b(f) \rightarrow \frac{f'}{f \cdot \ln b}$$

Trig:

$$\sin(f) \rightarrow f' \cos(f)$$

$$\cos(f) \rightarrow -f' \sin(f)$$

$$\tan(f) \rightarrow f' \sec(f)^2$$

$$\cot(f) \rightarrow -f' \csc(f)^2$$

$$\sec(f) \rightarrow f' \tan(f) \sec(f)$$

$$\csc(f) \rightarrow -f' \cot(f) \csc(f)$$

$$\arcsin(f) \rightarrow \frac{f'}{\sqrt{1-f^2}}$$

$$\arccos(f) \rightarrow \frac{-f'}{\sqrt{1-f^2}}$$

$$\arctan(f) \rightarrow \frac{f'}{f^2+1}$$

$$\operatorname{arcsec}(f) \rightarrow \frac{f'}{f^2 \sqrt{1-\frac{1}{f^2}}}$$

$$\operatorname{arccsc}(f) \rightarrow \frac{-f'}{f^2 \sqrt{1-\frac{1}{f^2}}}$$

$$\operatorname{arccot}(f) \rightarrow \frac{-f'}{f^2+1}$$

1.1 Examples

$$\frac{d}{dx} \sqrt[3]{x^2} = \frac{2}{3\sqrt[3]{x}}$$

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$$\frac{d}{dx} x^{\frac{2}{3}} = \frac{2}{3} x^{-\frac{1}{3}}$$

2 Anti-Derivatives

WIP

Power Rule: $x^n \rightarrow \frac{x^{n+1}}{n+1} + c$

IBP: $f(g) \cdot f' \rightarrow \int f(u)du$ where $u = g$