

1 General Derivative Rules

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|---------------------------|--|------------------|--|
| 1. Constant Rule | $\frac{d}{dx} [c] = 0$ | 5. Product Rule | $\frac{d}{dx} [f(x)g(x)] = f'(x)g(x) + f(x)g'(x)$ |
| 2. Constant Multiple Rule | $\frac{d}{dx} [cf(x)] = cf'(x)$ | 6. Quotient Rule | $\frac{d}{dx} \left[\frac{f(x)}{g(x)} \right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$ |
| 3. Sum Rule | $\frac{d}{dx} [f(x) + g(x)] = f'(x) + g'(x)$ | 7. Chain Rule | $\frac{d}{dx} [f(g(x))] = f'(g(x))g'(x)$ |
| 4. Difference Rule | $\frac{d}{dx} [f(x) - g(x)] = f'(x) - g'(x)$ | | |

2 Derivative Rules for Particular Functions

	Basic Rule	Chain Rule Form
1. Powers	$\frac{d}{dx} [x^n] = nx^{n-1}$	$\frac{d}{dx} [(f(x))^n] = n(f(x))^{n-1}f'(x)$
2. Sine	$\frac{d}{dx} [\sin x] = \cos x$	$\frac{d}{dx} [\sin (f(x))] = \cos (f(x))f'(x)$
3. Cosine	$\frac{d}{dx} [\cos x] = -\sin x$	$\frac{d}{dx} [\cos (f(x))] = -\sin (f(x))f'(x)$
4. Tangent	$\frac{d}{dx} [\tan x] = \sec^2 x$	$\frac{d}{dx} [\tan (f(x))] = \sec^2 (f(x))f'(x)$
5. Secant	$\frac{d}{dx} [\sec x] = \sec x \tan x$	$\frac{d}{dx} [\sec (f(x))] = \sec (f(x)) \tan (f(x))f'(x)$
6. Cosecant	$\frac{d}{dx} [\csc x] = -\csc x \cot x$	$\frac{d}{dx} [\csc (f(x))] = -\csc (f(x)) \cot (f(x))f'(x)$
7. Cotangent	$\frac{d}{dx} [\cot x] = -\csc^2 x$	$\frac{d}{dx} [\cot (f(x))] = -\csc^2 (f(x))f'(x)$
8. Exponential (base e)	$\frac{d}{dx} [e^x] = e^x$	$\frac{d}{dx} [e^{(f(x))}] = e^{(f(x))}f'(x)$
9. Exponential (base a)	$\frac{d}{dx} [a^x] = a^x \ln a$	$\frac{d}{dx} [a^{(f(x))}] = a^{(f(x))} \ln a f'(x)$
10. Natural Logarithm	$\frac{d}{dx} [\ln x] = \frac{1}{x}$	$\frac{d}{dx} [\ln f(x)] = \frac{1}{f(x)}f'(x)$
11. Logarithm (base a)	$\frac{d}{dx} [\log_a x] = \frac{1}{x \ln a}$	$\frac{d}{dx} [\log_a f(x)] = \frac{1}{f(x) \ln a} f'(x)$
12. Inverse Sine	$\frac{d}{dx} [\arcsin x] = \frac{1}{\sqrt{1-x^2}}$	$\frac{d}{dx} [\arcsin f(x)] = \frac{1}{\sqrt{1-(f(x))^2}} f'(x)$
13. Inverse Cosine	$\frac{d}{dx} [\arccos x] = \frac{-1}{\sqrt{1-x^2}}$	$\frac{d}{dx} [\arccos f(x)] = \frac{-1}{\sqrt{1-(f(x))^2}} f'(x)$
14. Inverse Tangent	$\frac{d}{dx} [\arctan x] = \frac{1}{1+x^2}$	$\frac{d}{dx} [\arctan f(x)] = \frac{1}{1+(f(x))^2} f'(x)$