1 General Derivative Rules

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

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)	$\frac{d}{dx}[e^x] = e^x$	$\frac{d}{dx}\left[e^{(f(x))}\right] = e^{(f(x))}f'(x)$
9. Exponential (base a)	$\frac{d}{dx}[a^x] = a^x \ln a$	$\frac{d}{dx}\left[a^{(f(x))}\right] = a^{(f(x))}\ln a f'(x)$
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	$\frac{d}{dx}[\arctan x] = \frac{1}{1+x^2}$	$\frac{d}{dx}[\arctan f(x)] = \frac{1}{1+(f(x))^2}f'(x)$

3 General Antiderivative Rules

Let $F(x)$ be any antiderivative of $f(x)$. That is, $F'(x) = f(x)$. The most general antiderivative of $f(x)$ is then $F(x) + C$.

	Original Function	General Antiderivative
1. Constant Rule	c (a constant)	$cx + C$
2. Constant Multiple Rule	$cf(x)$	$cF(x) + C$
3. Sum Rule	$f(x) + g(x)$	$F(x) + G(x) + C$
4. Difference Rule	$f(x) - g(x)$	$F(x) - G(x) + C$

4 Antiderivative Rules for Particular Functions

	Original Function	General Antiderivative
1. Powers ($n \neq -1$)	x^n	$\frac{x^{n+1}}{n+1} + C$
2. Powers ($n = -1$)	$\frac{1}{x}$	$\ln \lvert x \rvert + C$
3. Sine	$\sin x$	$-\cos x + C$
4. Cosine	$\cos x$	$\sin x + C$
5. Secant squared	$\sec^2 x$	$\tan x + C$
6. Secant times tangent	$\sec x \tan x$	$\sec x + C$
7. Cosecant times cotangent	$\csc x \cot x$	$-\csc x + C$
8. Cosecant squared	$\csc^2 x$	$-\cot x + C$
9. Exponential (base e)	e^x	$e^x + C$
10. Exponential (base a)	a^x	$\frac{a^x}{\ln a} + C$
11. Inverse trigonometric	$\frac{1}{\sqrt{1-x^2}}$	$\arcsin x + C$
12. Inverse trigonometric	$\frac{-1}{\sqrt{1-x^2}}$	$\arccos x + C$
13. Inverse trigonometric	$\frac{1}{1+x^2}$	$\arctan x + C$