Rules for Differentiation

1) Power rule: $\frac{d}{dx}\left[x^n\right] = nx^{n-1}$

2) Exponential rule: $\frac{d}{dx}\left[a^x\right] = a^x \ln(a)$

3) Natural Exponential rule: $\frac{d}{dx}\left[e^x\right] = e^x$

4) Logarithmic rule: $\frac{d}{dx}\left[\log_a x\right] = \frac{1}{x\ln(a)}$

5) Natural Logarithmic rule: $\frac{d}{dx}\left[\ln x\right] = \frac{1}{x}$

6) Sine function rule: $\frac{d}{dx}\left[\sin x\right] = \cos x$

7) Cosine function rule: $\frac{d}{dx}\left[\cos x\right] = -\sin x$

8) Tangent function rule: $\frac{d}{dx}\left[\tan x\right] = \sec^2 x = \frac{1}{\cos^2 x}$

9) Arcsine function rule: $\frac{d}{dx}\left[\arcsin x\right] = \frac{1}{\sqrt{1-x^2}}$

10) Arctangent function rule: $\frac{d}{dx}\left[\arctan x\right] = \frac{1}{1+x^2}$

11) Cotangent function rule: $\frac{d}{dx}\left[\cot x\right] = -\csc^2 x = -\frac{1}{\sin^2 x}$

12) Secant function rule: $\frac{d}{dx}\left[\sec x\right] = \sec x \tan x$

13) Cosecant function rule: $\frac{d}{dx}\left[\csc x\right] = -\csc x \cot x$

14) Arccosine function rule: $\frac{d}{dx}\left[\arccos x\right] = \frac{-1}{\sqrt{1-x^2}}$

15) Hyperbolic cosine function rule: $\frac{d}{dx}\left[\cosh x\right] = \sinh x$

16) Hyperbolic sine function rule: $\frac{d}{dx}\left[\sinh x\right] = \cosh x$

17) Hyperbolic tangent rule: $\frac{d}{dx}\left[\tanh x\right] = \frac{1}{\cosh^2 x}$

18) Product rule: $\frac{d}{dx}\left[f(x)g(x)\right] = f'(x)g(x) + f(x)g'(x)$

19) Quotient rule: $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{f'(x)g(x) - f(x)g'(x)}{\left[g(x)\right]^2}$

20) Chain rule: $\frac{d}{dx}\left[f(g(x)\right] = f'(g(x))g'(x)$

21) Constant multiple $\frac{d}{dx}\left[cf(x)\right] = = cf'(x)$

22) Constant multiple $\frac{d}{dx}\left[\frac{f(x)}{c}\right] = \frac{1}{c}f'(x) = \frac{f'(x)}{c}$

23) Addition rule: $\frac{d}{dx}\left[f(x)+g(x)\right] = f'(x)+g'(x)$

24) Subtraction rule: $\frac{d}{dx}\left[f(x)-g(x)\right] = f'(x)-g'(x0$