Calculus II and III

Definition 1: Derivative Formulas

$$\frac{d}{dx}(c) = 0$$

$$\frac{d}{dx}(f \pm g) = f' \pm g'$$

$$\frac{d}{dx}(kx) = k$$

$$\frac{d}{dx}(x^n) = nx^{n-1}$$

$$(f\ g)' = f'g + fg'$$

$$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$$

$$(f(g(x)))' = f'(g(x)) \cdot g'(x)$$

$$\frac{d}{dx}(a^x) = a^x \ln a$$

$$\frac{d}{dx}(e^x) = e^x$$

$$\frac{d}{dx}(\ln x) = \frac{1}{x}$$

$$\frac{d}{dx}(\log_a x) = \frac{1}{x \ln a}$$

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

$$\frac{d}{dx}(\ln(f(x))) = \frac{1}{f(x)} \cdot f'(x)$$

$$\frac{d}{dx}(\sin x) = \cos x$$

$$\frac{d}{dx}(\cos x) = -\sin x$$

$$\frac{d}{dx}(\tan x) = \sec^2 x$$

$$\frac{d}{dx}(\sec x) = \sec x\ \tan x$$

$$\frac{d}{dx}(\csc x) = -\csc x\ \cot x$$

$$\frac{d}{dx}(\cot x) = -\csc^2 x$$

$$\frac{d}{dx}\left(\sin^{-1} x\right) = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\left(\cos^{-1} x\right) = \frac{-1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\left(\tan^{-1} x\right) = \frac{1}{1+x^2}$$

$$\frac{d}{dx}\left(\cot^{-1} x\right) = \frac{-1}{1+x^2}$$

$$\frac{d}{dx}\left(\sec^{-1} x\right) = \frac{1}{x\sqrt{x^2-1}}$$

$$\frac{d}{dx}\left(\csc^{-1} x\right) = \frac{-1}{x\sqrt{x^2-1}}$$

Definition 2: Integral Formulas

$$\int x^n\ dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$$

$$\int \frac{1}{x}\ dx = \ln|x| + C$$

$$\int \frac{1}{kx+b}\ dx = \frac{1}{k}\ln|kx+b| + C$$

$$\int e^x\ dx = e^x + C$$

$$\int e^{kx}\ dx = \frac{1}{k}e^{kx} + C$$

$$\int a^x\ dx = \frac{a^x}{\ln a} + C$$

$$\int a^{kx}\ dx = \frac{1}{k\ln a}a^{kx} + C$$

$$\int \ln x\ dx = x\ln x - x + C$$

$$\int \cos x\ dx = \sin x + C$$

$$\int \cos(bx)\ dx = \frac{1}{b}\sin(bx) + C$$

$$\int \sin x\ dx = -\cos x + C$$

$$\int \sin(bx)\ dx = -\frac{1}{b}\cos(bx) + C$$

$$\int \sec^2 x\ dx = \tan x + C$$

$$\int \csc^2 x\ dx = -\cot x + C$$

$$\int \sec x \tan x\ dx = \sec x + C$$

$$\int \csc x \cot x\ dx = -\csc x + C$$

$$\int \tan x\ dx = \ln|\sec x| + C$$

$$\int \cot x\ dx = \ln|\sin x| + C$$

$$\int \csc x\ dx = \ln|\csc x - \cot x| + C$$

$$\int \sec x\ dx = \ln|\sec x + \tan x| + C$$

$$\int \frac{1}{\sqrt{a^2-x^2}}\ dx = \sin^{-1}\left(\frac{x}{a}\right) + C$$

$$\int \frac{1}{a^2+x^2}\ dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C$$

$$\int \frac{1}{x\sqrt{x^2-1}}\ dx = \sec^{-1}(x) + C$$

$$\int -\frac{1}{x\sqrt{x^2-1}}\ dx = \csc^{-1}(x) + C$$