Derivatives and Integration Formulas

Trigonometric Formulas:

Derivatives

$$\frac{d}{dx}(\sin u) = \cos u \bullet \frac{du}{dx}$$

$$\frac{d}{dx}(\cos u) = -\sin u \bullet \frac{du}{dx}$$

$$\frac{d}{dx}(\tan u) = \sec^2 u \bullet \frac{du}{dx}$$

$$\frac{d}{dx}(\csc u) = -\csc u \cot u \bullet \frac{du}{dx}$$

$$\frac{d}{dx}(\sec u) = \sec u \tan u \bullet \frac{du}{dx}$$

$$\frac{d}{dx}(\cot u) = -\csc^2 u \bullet \frac{du}{dx}$$

Integrals

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

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

$$\int \tan x dx = -\ln|\cos x| + C$$

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

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

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

$$\int \cos(kx) dx = \frac{\sin(kx)}{k} + C$$

(Similar formulas for all the others)

Logs and Exponentials

$$\frac{d}{dx}(\ln u) = \frac{1}{u} \bullet \frac{du}{dx} \text{ or } = \frac{u'}{u}$$

$$\frac{d}{dx}(\log_a u) = \frac{1}{u \ln a} \bullet \frac{du}{dx}$$

$$\frac{d}{dx}(e^u) = e^u \bullet \frac{du}{dx}$$

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

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

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

Inverse Trigonometric Functions

Derivatives

$$\frac{d}{dx}(\sin^{-1} u) = \frac{1}{\sqrt{1-u^2}} \bullet \frac{du}{dx}$$

$$\frac{d}{dx}(\cos^{-1} u) = \frac{-1}{\sqrt{1-u^2}} \bullet \frac{du}{dx}$$

$$\frac{d}{dx}(\tan^{-1} u) = \frac{1}{1+u^2} \bullet \frac{du}{dx}$$

$$\frac{d}{dx}(\csc^{-1} u) = \frac{-1}{u\sqrt{u^2-1}} \bullet \frac{du}{dx}$$

$$\frac{d}{dx}(\sec^{-1} u) = \frac{1}{u\sqrt{u^2-1}} \bullet \frac{du}{dx}$$

$$\frac{d}{dx}(\cot^{-1} u) = \frac{-1}{1+u^2} \bullet \frac{du}{dx}$$

Integrals

$$\int \frac{1}{\sqrt{1-u^2}} du = \sin^{-1} u + C$$

$$\int \frac{1}{u\sqrt{u^2-1}} du = \sec^{-1} u + C$$

$$\int \frac{1}{1+u^2} du = \tan^{-1} u + C$$

$$\int \frac{1}{\sqrt{a^2-u^2}} du = \sin^{-1} \frac{u}{a} + C$$

$$\int \frac{1}{u\sqrt{u^2-a^2}} du = \frac{1}{a}\sec^{-1}\left|\frac{u}{a}\right| + C$$

$$\int \frac{1}{a^2+u^2} du = \frac{1}{a}\tan^{-1}\left|\frac{u}{a}\right| + C$$

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

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C = \frac{1}{n+1} x^{n+1} + C$$

Product Rule:

$$\frac{d}{dx}(uv) = uv' + vu'$$

Quotient Rule:

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{vu' - uv'}{v^2}$$

Chain Rule:

$$\frac{d}{dx}[f(g(x))] = f'(g(x)) \bullet g'(x)$$

$$\frac{d}{dx}[f(x)^n] = n[f(x)]^{n-1} \bullet f'(x)$$

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$