Calculus: Derivative Formulas

Non-Chain-Rule

$$\frac{d}{dx}X^n = n \cdot X^{n-1}$$

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

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

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

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

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

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

Inverse trig functions

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

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

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

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

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

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

Chain-Rule

$$\frac{d}{dx}u^n = n \cdot u^{n-1} \cdot u'$$

$$\frac{d}{dx}\sin(u) = \cos(u) \cdot u'$$

$$\frac{d}{dx}\cos(u) = -\sin(u) \cdot u'$$

$$\frac{d}{dx}\tan(u) = \sec^2(u) \cdot u'$$

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

$$\frac{d}{dx}\sec(u) = \sec(u)\tan(u) \cdot u'$$

$$\frac{d}{dx}\csc(u) = -\csc(u)\cot(u) \cdot u'$$

$$\frac{d}{dx}e^u = e^u \cdot u'$$

$$\frac{d}{dx}\ln u = \frac{1}{u} \cdot u' = \frac{u'}{u}$$

Product and Quotient Rules

$$\frac{d}{dx}(u \cdot v) = u \cdot v' + v \cdot u'$$

$$\frac{d}{dx}\left[\frac{u}{v}\right] = \frac{v \cdot u' - u \cdot v'}{v^2}$$

Need help using these? Check out www.ThatTutorGuy.com for videos covering all these formulas and more, with lots of examples and common trick questions that most calculus teachers use.

Calculus: Integral Formulas

Common Integrals

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

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

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

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

Trig Integrals

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

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

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

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

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

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

Double Angle Formulas

$$\sin 2\theta = 2\sin\theta\cos\theta$$

$$\cos 2\theta = \cos^2\theta - \sin^2\theta$$
$$= 1 - 2\sin^2\theta$$
$$= 2\cos^2\theta - 1$$

Power Reducing Formulas (helpful for trig integrals)

$$\sin^2 X = \frac{1-\cos 2X}{2}$$

$$\cos^2 X = \frac{1+\cos 2X}{2}$$

Washer and Shell Formulas

$$V = \pi\int_a^b (R^2 - r^2)dx$$

$$V = 2\pi\int_a^b h(x)\cdot r(x)dx = 2\pi\int_a^b \left[f(x) - g(x)\right](x-c)dx$$

Integration by parts

$$\int u\, dv = uv - \int v\, du$$

Arc Length

$$s = \int \sqrt{1+[f'(x)]^2}\, dx$$

$$s = \int \sqrt{1+[f'(y)]^2}\, dy$$

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