DERIVATIVE RULES: *a* is a constant

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

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

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

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

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

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

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

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

$$\frac{d}{dx}\ln\left[f(x)\right]=\frac{f'(x)}{f(x)}$$

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

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

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

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

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

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

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

$$\frac{d}{dx}\sin^{-1}x=\frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\cos^{-1}x=\frac{-1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\tan^{-1}x=\frac{1}{1+x^2}$$

$$\frac{d}{dx}\cot^{-1}x=\frac{-1}{1+x^2}$$

$$\frac{d}{dx}\sec^{-1}x=\frac{1}{x\sqrt{x^2-1}}$$

$$\frac{d}{dx}\csc^{-1}x=\frac{-1}{x\sqrt{x^2-1}}$$

INTEGRATION RULES & FORMULAS: *a* and *C* are constants. I left out simple memorized integrals that are covered in the derivative rules above.

$$\int\frac{f'(x)}{f(x)}dx=\ln\left|f(x)\right|+C$$

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

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

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

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

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

$$\int\sin(ax)dx=\frac{-\cos(ax)}{a}+C$$

$$\int\cos(ax)dx=\frac{\sin(ax)}{a}+C$$

$$\int f'(ax)dx=\frac{f(ax)}{a}+C$$

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

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

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