Formula Sheet

Pythagorean Identities

$\sin^2\theta + \cos^2\theta = 1 \qquad \tan^2\theta + 1 = \sec^2\theta \qquad \cot^2\theta + 1 = \csc^2\theta$

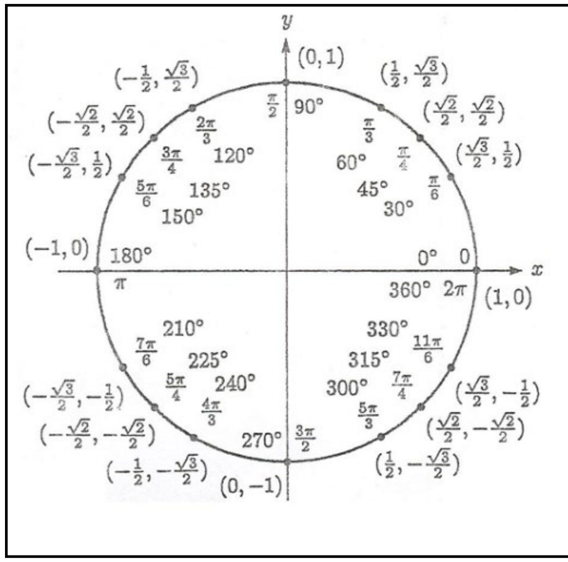
Reciprocal Identities

$\tan\theta = \dfrac{\sin\theta}{\cos\theta} \qquad \cot\theta = \dfrac{\cos\theta}{\sin\theta} \qquad \csc\theta = \dfrac{1}{\sin\theta} \qquad \sec\theta = \dfrac{1}{\cos\theta}$

Double Angle Identities

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

$\cos^2\theta = \dfrac{1+\cos 2\theta}{2} \qquad \sin^2\theta = \dfrac{1-\cos 2\theta}{2}$



Derivative Quotient Rule: $\dfrac{d}{dx}\left(\dfrac{\text{HI}}{\text{LO}}\right) = \dfrac{(\text{LO})\cdot\frac{d}{dx}(\text{HI}) \; - \; (\text{HI})\cdot\frac{d}{dx}(\text{LO})}{(\text{LO})^2}$

Derivative Product Rule: $\dfrac{d}{dx}(u\cdot v) = u\cdot v' + v\cdot u'$ **The "Parts" Equation**: $\int u\,dv = u\cdot v - \int v\,du$

Chain Rule: $\frac{d}{dx}w(u) = w'(u)\cdot u'(x)$

Suppose $u = f(x)$ $\quad = w'(f(x))\cdot f'(x) = \frac{dw}{du}\cdot\frac{du}{dx}$

U-Substitution: $\left\{\begin{array}{l} u = f(x) \\ du = f'(x)dx \end{array}\right\} \Rightarrow \int w'(f(x))\cdot f'(x)dx = \int w'(u)\cdot du = w(u) + C$

$\dfrac{d}{dx}u^n = nu^{n-1}\cdot\dfrac{du}{dx} \qquad \int u^n du = \dfrac{u^{n+1}}{n+1} + C,\ n \neq -1$

$\dfrac{d}{dx}e^u = e^u\cdot\dfrac{du}{dx} \qquad \int e^u du = e^u + C$

$\dfrac{d}{dx}\ln u = \dfrac{1}{u}\cdot\dfrac{du}{dx} \qquad \int \dfrac{1}{u}\cdot du = \int\dfrac{du}{u} = \ln|u| + C$

$\dfrac{d}{dx}\sin u = \cos u\cdot\frac{du}{dx} \qquad \dfrac{d}{dx}\cos u = -\sin u\cdot\frac{du}{dx}$

$\dfrac{d}{dx}\tan u = \sec^2 u\cdot\frac{du}{dx} \qquad \dfrac{d}{dx}\cot u = -\csc^2 u\cdot\frac{du}{dx}$

$\dfrac{d}{dx}\sec u = \sec u\tan u\cdot\frac{du}{dx} \qquad \dfrac{d}{dx}\csc u = -\csc u\cot u\cdot\frac{du}{dx}$

$\int \sin u\,du = -\cos u + C \qquad \int \cos u\,du = \sin u + C$

$\int \sec^2 u\,du = \tan u + C \qquad \int \csc^2 u\,du = -\cot u + C$

$\int \sec u\tan u\,du = \sec u + C \qquad \int \csc u\cot u\,du = -\csc u + C$

$\int \tan u\,du = \ln|\sec u| + C = -\ln|\cos u| + C \qquad \int \cot u\,du = -\ln|\csc u| + C = \ln|\sin u| + C$

$\int \sec u\,du = \ln|\sec u + \tan u| + C \qquad \int \csc u\,du = -\ln|\csc u + \cot u| + C$

$\dfrac{d}{dx}\sin^{-1}u = \dfrac{1}{\sqrt{1-u^2}}\cdot\dfrac{du}{dx} \qquad \dfrac{d}{dx}\cos^{-1}u = -\dfrac{1}{\sqrt{1-u^2}}\cdot\dfrac{du}{dx}$

$\dfrac{d}{dx}\tan^{-1}u = \dfrac{1}{1+u^2}\cdot\dfrac{du}{dx} \qquad \dfrac{d}{dx}\cot^{-1}u = -\dfrac{1}{1+u^2}\cdot\dfrac{du}{dx}$

$\dfrac{d}{dx}\sec^{-1}u = \dfrac{1}{|u|\sqrt{u^2-1}}\cdot\dfrac{du}{dx} \qquad \dfrac{d}{dx}\csc^{-1}u = -\dfrac{1}{|u|\sqrt{u^2-1}}\cdot\dfrac{du}{dx}$

$\int \dfrac{1}{\sqrt{a^2-u^2}}du = \sin^{-1}\left(\dfrac{u}{a}\right) + C$

$\int \dfrac{1}{a^2+u^2}du = \dfrac{1}{a}\tan^{-1}\left(\dfrac{u}{a}\right) + C$

$\int \dfrac{1}{\sqrt{u^2-a^2}}du = \ln|u + \sqrt{u^2-a^2}| + C$

Arc Length $\int_a^b \sqrt{1+[f'(x)]^2}\,dx$ or $\int_c^d \sqrt{1+[g'(y)]^2}\,dy$ **Surface Area:** $\int_a^b 2\pi f(x)\sqrt{1+[f'(x)]^2}\,dx \qquad \int_c^d 2\pi g(y)\sqrt{1+[g'(y)]^2}\,dy$