$$\sqrt{(a^2-x^2)}$$

$$x = a * \sin\theta, \ -\pi/2 \leq \theta \leq \pi/2$$

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

$$\sqrt{(a^2+x^2)}$$

$$x = a * \tan\theta, \ -\pi/2 \le \theta \le \pi/2$$

$$1 + \tan^2\theta = \sec^2\theta$$

$$\sqrt{(x^2-a^2)}$$

$$x = a \cdot \sec\theta,\ 0 \le \theta \le \pi/2 \text{ or } \pi \le \theta \le 3\pi/2$$

$$\sec^2\theta - 1 = \tan^2\theta$$

$$\int 1/x \, dx$$

$$\ln|x|+c$$

$$\int \cos(x)\, dx$$

$$\sin(x)+c$$

$$\int \cot(x)\, dx$$

$$\ln|\sin(x)|+c$$

$$\int \csc(x) \cot(x)\, dx$$

$$-\csc(x)+c$$

$$\int \csc^2(x)\,dx$$

$$-\cot(x)+c$$

$$\int e^{n}\, dn$$

$$e^n + c$$

$$\int \sec(x) \tan(x)\, dx$$

$$\sec(x)+c$$

$$\int \sec^2(x)\, dx$$

$$\tan(x)+c$$

$$\int \sin(x)\, dx$$

$$- \cos(x)$$

$$\int \tan(x)\, dx$$

$$\ln|\sec(x)|+c$$

$$\cos^2\theta$$

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

$$\cot(\theta)$$

$$\cos(\theta) / \sin(\theta)$$

$\cot(\theta)$

$$1/\tan(\theta)$$

$\cot^2\theta$

$$\csc^2\theta - 1$$

$$\csc(\theta)$$

$$1/\sin(\theta)$$

$$\csc^2\theta$$

$$\cot^2\theta + 1$$

$$\frac{d}{dx}[\cos(x)]$$

$$- \sin(x)$$

$$d/dx\ [\cot(x)]$$

$$-\csc^2(x)$$

$$\frac{d}{dx}\left[\csc(x)\right]$$

$$-\csc(x)\cot(x)$$

$$\frac{d}{dx}[\sec(x)]$$

$$\sec(x)\tan(x)$$

$$d/dx\,[\sin(x)]$$

$$\cos(x)$$

$$d/dx\,[\tan(x)]$$

$$\sec^2(x)$$

Half-angle: $\cos^2 x$

$$1/2\ [1+\cos(2x)]$$

Half-angle: $\sin^2 x$

$$1/2\ [1-\cos(2x)]$$

Harmonic Series

Sum of 1/n from 1 to infinity.
Always divergent.

How do you determine whether or not a Geometric Series converges using the common ratio?

if $|r| < 1$, then the series converges
if $|r| > 1$, then the series diverges

How do you find the common ratio $|r|$ for a geometric series $\{a_1 + a_2 + a_3 + \ldots\}$?

$$|r| = (a_2/a_1)$$

How do you tell whether or not a p-series converges?

Sum of $1/n^p$ from 1 to infinity.
If $p > 1$, then the series converges.
If $p <= 1$ then the series diverges.

nth Term Test (Divergence Test)

If Limit as n -> oo of nth term is 0, test is inconclusive!

Diverges if Limit as n -> oo of nth term is anything other than 0.

$$\sec(\theta)$$

$$1/\cos(\theta)$$

$$\sec^2\theta$$

$$1+\tan^2\theta$$

$$\sin(x)\cos(x)$$

$$1/2\ [\sin(2x)]$$

$$\sin^2\theta$$

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

Sum of Geometric Series

$$S_n = a / (1-r)$$

Note: beginning index must be n=1

$$\tan(\theta)$$

$$\sin(\theta) / \cos(\theta)$$

$\tan^2\theta$

$$\sec^2\theta - 1$$