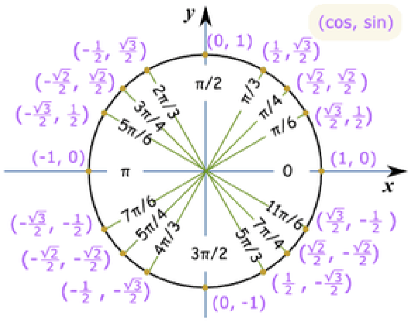
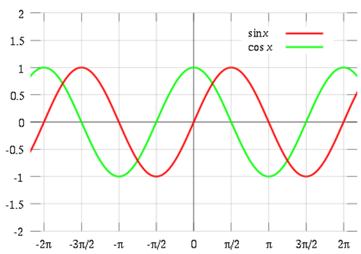
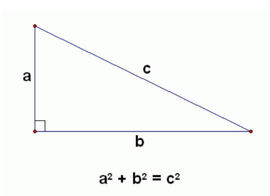
Trigonometry







$\sin(\theta) = \frac{opp}{hyp} \quad \cos(\theta) = \frac{adj}{hyp}$

$\csc(\theta) = \frac{hyp}{opp} \quad \sec(\theta) = \frac{hyp}{adj}$

$\tan(\theta) = \frac{opp}{adj} \quad \cot(\theta) = \frac{adj}{opp}$

$\csc(\theta) = \frac{1}{\sin(\theta)} \quad \sec(\theta) = \frac{1}{\cos(\theta)}$

$\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)} \quad \cot(\theta) = \frac{\cos(\theta)}{\sin(\theta)}$

$\sin^2(\theta) + \cos^2(\theta) = 1$

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

$1 + \cot^2(\theta) = \csc^2(\theta)$

$\sin(2\theta) = 2\sin(\theta)\cos(\theta)$

$\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta)$

$\sin^2(\theta) = \frac{1 - \cos(2\theta)}{2}$

$\cos^2(\theta) = \frac{1 + \cos(2\theta)}{2}$

Inverse Trig Functions

$\arcsin(x) \Rightarrow \text{range} = [-\pi/2, \pi/2]$

$\arctan(x) \Rightarrow \text{range} = (-\pi/2, \pi/2)$

$\text{arcsec}(x) \Rightarrow \text{range} = [0, \pi/2) \cup [\pi, 3\pi/2)$

Exponential/Log Functions

$e^{\ln(x)} = x \quad \ln(e^x) = x$

$e^0 = 1, \quad \ln(1) = 0, \quad \ln(e) = 1$

$\lim_{x\to-\infty} e^x = 0 \quad \lim_{x\to 0^+} \ln(x) = -\infty$

$\ln(xy) = \ln(x) + \ln(y)$

$\ln(x/y) = \ln(x) - \ln(y)$

$\ln(x^y) = y\ln(x)$

Derivatives

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

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

$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$

$\frac{d}{dx}(f(x)g(x)) = f'(x)g(x) + f(x)g'(x)$

$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{f'(x)g(x) - f(x)g'(x)}{g(x)^2}$

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

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

$\frac{d}{dx}(\ln(x)) = \frac{1}{x}$

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

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

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

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

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

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

$\frac{d}{dx}(\arcsin(x)) = \frac{1}{\sqrt{1-x^2}}$

$\frac{d}{dx}(\arccos(x)) = -\frac{1}{\sqrt{1-x^2}}$

$\frac{d}{dx}(\arctan(x)) = \frac{1}{1+x^2}$

$\frac{d}{dx}(\text{arccsc}(x)) = -\frac{1}{x\sqrt{x^2-1}}$

$\frac{d}{dx}(\text{arcsec}(x)) = \frac{1}{x\sqrt{x^2-1}}$

$\frac{d}{dx}(\text{arccot}(x)) = -\frac{1}{1+x^2}$

Integrals

$\int_a^b f(x)dx = F(b) - F(a)$

$\int x^n dx = \frac{x^{n+1}}{n+1} + C \quad \text{for } n \neq -1$

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

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

$\int \ln x \, dx = x\ln x - x + C$

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

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

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

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

$\int \sec(x)\tan(x)dx = \sec(x) + C$

$\int \csc(x)\cot(x)dx = -\csc(x) + C$

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

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

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

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

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

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

Integration by parts

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

Trig substitution

$a^2 - x^2 \Rightarrow x = a\sin\theta$

$x^2 - a^2 \Rightarrow x = a\sec\theta$

$x^2 + a^2 \Rightarrow x = a\tan\theta$

Partial fractions (examples)

$\frac{\cdot}{(x+1)(3x-4)} = \frac{A}{x+1} + \frac{B}{3x-4}$

$\frac{\cdot}{x(x+2)^2} = \frac{A}{x} + \frac{B}{x+2} + \frac{C}{(x+2)^2}$

$\frac{\cdot}{x(x^2+3)} = \frac{A}{x} + \frac{Bx+C}{x^2+3}$