Formulas from Trigonometry

$$\sin\theta=\frac{opp}{hyp}=\frac{y}{r}$$
$$\cos\theta=\frac{adj}{hyp}=\frac{x}{r}$$
$$\tan\theta=\frac{opp}{adj}=\frac{y}{x}=\frac{\sin\theta}{\cos\theta}$$
$$csc\,\theta=\frac{hyp}{opp}=\frac{1}{\sin\theta}$$
$$sec\,\theta=\frac{hyp}{adj}=\frac{1}{\cos\theta}$$
$$\cot\theta=\frac{adj}{opp}=\frac{1}{\tan\theta}=\frac{\cos\theta}{\sin\theta}$$
$$\sin^2\theta+\cos^2\theta=1$$
$$1+\tan^2\theta=sec^2\theta$$
$$1+\cot^2\theta=csc^2\theta$$

Addition Formulas

$$\sin(\alpha+\beta)=\sin\alpha\cos\beta+\sin\beta\cos\alpha$$
$$\cos(\alpha+\beta)=\cos\alpha\cos\beta-\sin\alpha\sin\beta$$
$$\tan(\alpha+\beta)=\frac{\sin(\alpha+\beta)}{\cos(\alpha+\beta)}=\frac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}$$

Subtraction Formulas

$$\sin(\alpha-\beta)=\sin\alpha\cos\beta-\sin\beta\cos\alpha$$
$$\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$$
$$\tan(\alpha-\beta)=\frac{\sin(\alpha-\beta)}{\cos(\alpha-\beta)}=\frac{\tan\alpha-\tan\beta}{1+\tan\alpha\tan\beta}$$

Half-Angle Formulas

$$\sin\left(\frac{\alpha}{2}\right)=\pm\sqrt{\frac{1-\cos\alpha}{2}}$$
$$\cos\left(\frac{\alpha}{2}\right)=\pm\sqrt{\frac{1+\cos\alpha}{2}}$$
$$\tan\left(\frac{\alpha}{2}\right)=\frac{1-\cos\alpha}{\sin\alpha}=\frac{\sin\alpha}{1+\cos\alpha}$$

Double Angle Formulas

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

Law of Sines

$$\frac{\sin\alpha}{a}=\frac{\sin\beta}{b}=\frac{\sin\gamma}{c}$$

Law of Cosines

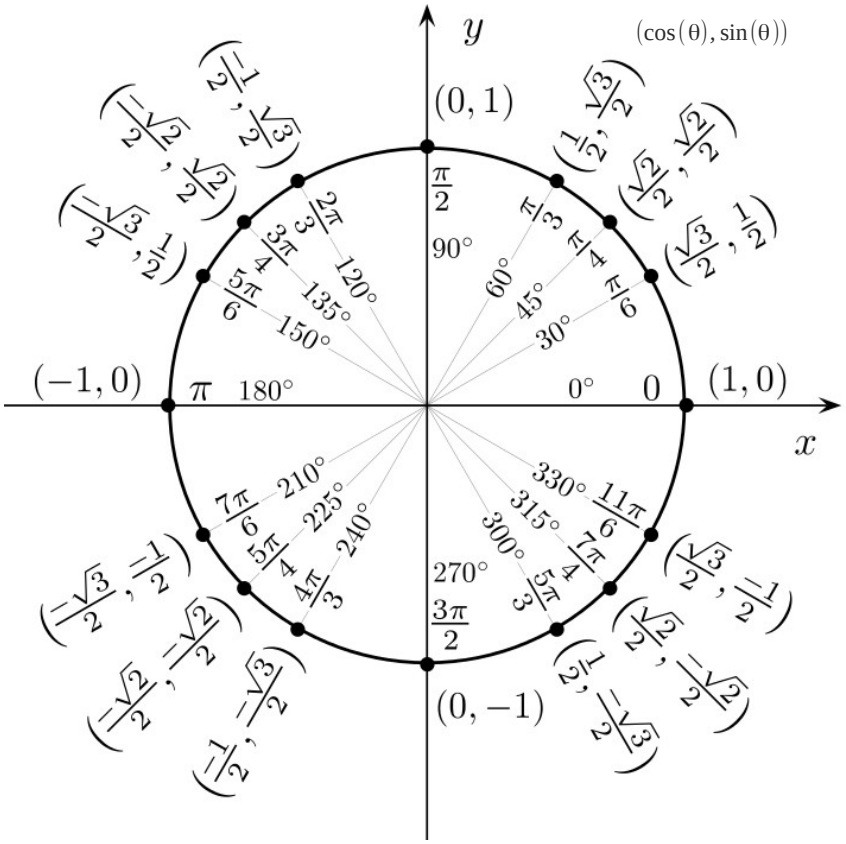
$$a^2=b^2+c^2-2bc\cos\alpha$$
$$b^2=a^2+c^2-2ac\cos\beta$$
$$c^2=a^2+b^2-2ab\cos\gamma$$

Circular Sector

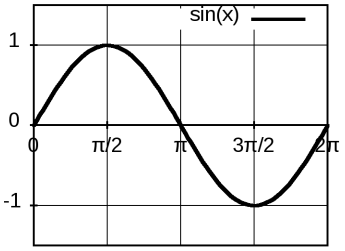
$$s=r\theta \qquad A=\frac{1}{2}r^2\theta$$

Constants

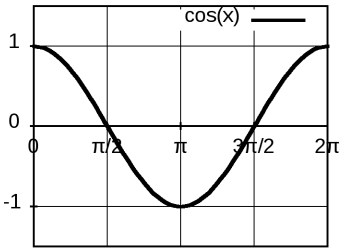
$\pi=3.14159265358979323846264338327950288419716939937510$
$e=2.71828182845904523536028747135266249775724709369995$
$\varphi=1.61803398874989484820458683436563811772030917980576$



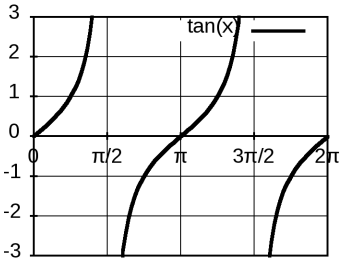
Sine Graph



Cosine Graph



Tangent Graph



Formulas From Algebra

Quadratic Formula

if $ax^2+bx+c=0$ *then*

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$
$$vertex=\left(\frac{-b}{2a},f\left(\frac{-b}{2a}\right)\right)=(h,k)$$
$$y=a(x-h)^2+k$$

Distance Formula

$$d=\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$$

Midpoint Formula

$$midpoint=\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$$

Factoring Formulas

$$x^2-y^2=(x+y)(x-y)$$
$$x^2\pm 2xy+y^2=(x\pm y)^2$$
$$x^3\pm y^3=(x\pm y)(x^2\mp xy+y^2)$$

Associative Property

$$a+(b+c)=(a+b)+c$$
$$a(bc)=(ab)c$$

Commutative Property

$$a+b=b+a$$
$$ab=ba$$

Distributive Property

$$a(b+c)=ab+ac$$

Exponents and Radicals

$a^x * a^y = a^{x+y}$

$(a^x)^y = a^{xy}$

$(ab)^x = a^x b^x$

$\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$

$\frac{a^x}{a^y} = a^{x-y}$

$a^{-x} = \frac{1}{a^x}$

$a^{\frac{1}{x}} = \sqrt[x]{a}$

$\sqrt[x]{a^y} = a^{\frac{y}{x}}$

Line Equations

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$y = mx + b$

$y - y_1 = m(x - x_1)$

Circle Equations

$Center = (h, k) \quad radius = r:$

$(x-h)^2 + (y-k)^2 = r^2$

$y = k \pm \sqrt{r^2 - (x-h)^2}$

Exponentials and Logarithms

$y = \log_b x \Leftrightarrow b^y = x$

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

$\log\left(\frac{x}{y}\right) = \log x - \log y$

$\log(x^a) = a\log(x)$

$a^{\log_a(x)} = x$

$\log_a(a^x) = x$

$\log(1) = 0$

$\log_a(a) = 1 \qquad \ln(e) = 1$

$\log(x) = \log_{10}(x)$

$\ln(x) = \log_e(x)$

$\log_b(x) = \frac{\log(x)}{\log(b)} = \frac{\ln(x)}{\ln(b)}$

Function Modifications

$g(x) = a * f(b*x - c) + d$

a = vertical stretch

b = horizontal squeeze

c = horizontal shift

d = vertical shift

Formulas from Geometry

Right Triangle

$c^2 = a^2 + b^2 \qquad A = \frac{1}{2}ab$

Equilateral Triangle

$h = \frac{\sqrt{3}}{2}s \qquad A = \frac{\sqrt{3}}{4}s^2$

Triangle

$A = \frac{1}{2}bh = \frac{1}{2}ab\sin(\theta)$

Trapezoid

$A = \frac{1}{2}(a+b)h$

Rectangle

$A = lw \qquad P = 2l + 2w$

Circle

$A = \pi r^2 \qquad C = 2\pi r$

Right Circular Cone

$V = \frac{1}{3}\pi r^2 h = \frac{1}{3}A_{base}h$

$S = \pi r\sqrt{r^2 + h^2}$

Sphere

$V = \frac{4}{3}\pi r^3 \qquad S = 4\pi r^2$

Rectangular Box

$V = lwh$

$S = 2hl + 2lw + 2hw$

Right Circular Cylinder

$V = \pi r^2 h$

$S = 2\pi rh + 2\pi r^2$

Circular Sector

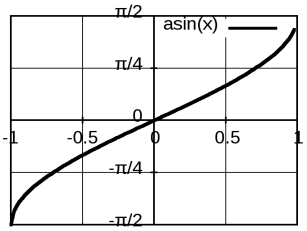
$s = r\theta \qquad A = \frac{1}{2}r^2\theta$

Parallelogram

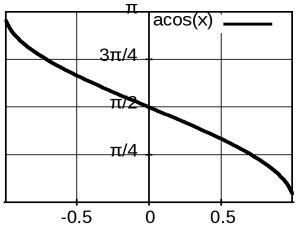
$A = bh = ab\sin(\theta)$

Inverse Trigonometry Functions

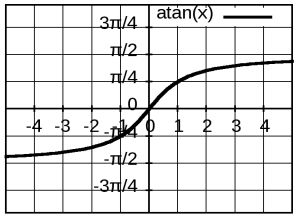
$f(x) = \arcsin(x)$



$f(x) = \arccos(x)$

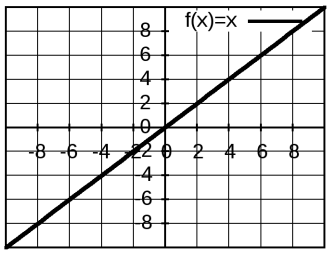


$f(x) = \arctan(x)$

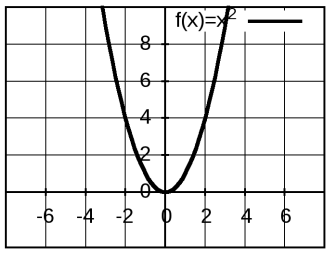


Common Function Graphs

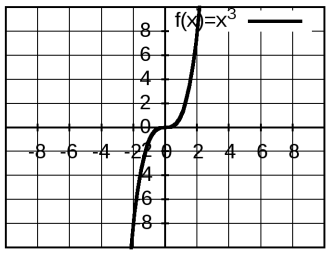
$f(x) = x$



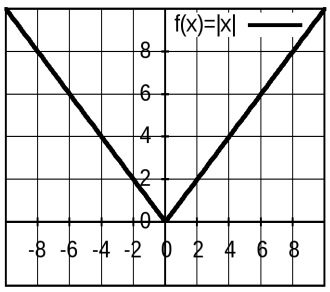
$f(x) = x^2$



$f(x) = x^3$



$f(x) = |x|$



$f(x) = \sqrt{x}$