Greek Characters

Name	Symbol	Typical use(s)
alpha	α	angle, constant
beta	β	angle, constant
gamma	γ	angle, constant
epsilon	ϵ or ε	angle, constant
theta	θ or ϑ	angle, constant
pi	π or π	circular constant
phi	ϕ or φ	angle, constant

Named Sets

empty set	$\varnothing$
real numbers	$\mathbf{R}$
ordered pairs of reals	$\mathbf{R}^2$
integers	$\mathbf{Z}$
positive integers	$\mathbf{Z}_{>0}$
positive real numbers	$\mathbf{R}_{>0}$

Set Symbols

Meaning	Symbol
is a member	$\in$
subset	$\subset$
intersection	$\cap$
union	$\cup$
set minus	$\setminus$

Intervals

For numbers a and b, we define the intervals:

$$(a,b) = \{x \in \mathbf{R} \mid a < x < b\}$$
$$[a,b) = \{x \in \mathbf{R} \mid a \le x < b\}$$
$$(a,b] = \{x \in \mathbf{R} \mid a < x \le b\}$$
$$[a,b] = \{x \in \mathbf{R} \mid a \le x \le b\}$$
$$(-\infty,a) = \{x \mid x < a\}$$
$$(-\infty,a] = \{x \mid x \le a\}$$
$$(a,\infty) = \{x \mid a < x\}$$
$$[a,\infty) = \{x \mid a \le x\}$$

Logic Symbols

Meaning	Symbol
negation	$\neg$
and	$\wedge$
or	$\vee$
implies	$\implies$
equivalent	$\equiv$
for all	$\forall$
there exists	$\exists$

Exponents

For $a, b > 0$ and m, n real:

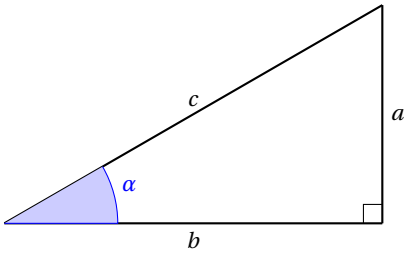
$$a^0 = 1, \qquad 0^a = 0$$
$$1^a = 1, \qquad a^n a^m = a^{n+m}$$
$$a^n / a^m = a^{n-m}, \qquad (a^n)^m = a^{n \cdot m}$$

Polar to Cartesian

$$x = r\cos(\theta)$$
$$y = r\sin(\theta)$$

$$r = \sqrt{x^2 + y^2}$$
$$\theta = \begin{cases} \arccos(x/r) & \text{if } y \ge 0 \\ 2\pi - \arccos(x/r) & \text{if } y < 0 \end{cases}$$

Right Triangle Trigonometry



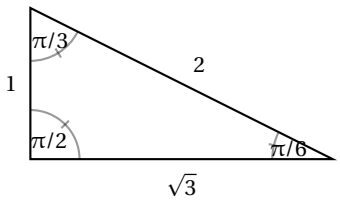
$$\sin(\alpha) = a/c \qquad \cos(\alpha) = b/c \qquad \tan(\alpha) = a/b$$
$$\csc(\alpha) = c/a \qquad \sec(\alpha) = c/b \qquad \cot(\alpha) = b/a$$

Trigonometric Identities

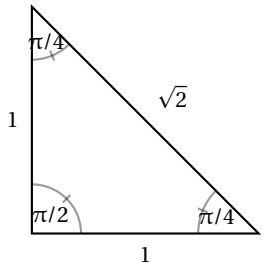
$$\sin(x)^2 + \cos(x)^2 = 1$$
$$2\cos(x)^2 = 1 + \cos(2x)$$
$$2\sin(x)^2 = 1 - \cos(2x)$$
$$\sin(x+y) = \sin(x)\cos(y) + \cos(x)\sin(y)$$
$$\cos(x+y) = \cos(x)\cos(y) - \sin(x)\sin(y)$$

Famous Triangles

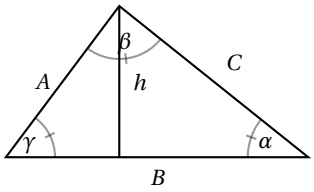
The 30-60-90 triangle



The 45-45-90 triangle



Laws of Cosine & Sine



Law of cosines

$$C^2 = A^2 + B^2 - 2AB\cos(\gamma)$$

Law of sines

$$\frac{\sin\alpha}{A} = \frac{\sin\beta}{B} = \frac{\sin\gamma}{C}$$

Area

$$\text{Area} = hB/2 = AB\sin(\gamma)/2$$

Solution of equations

Algebraic

$$[ab = 0] \equiv [a = 0 \textbf{ or } b = 0]$$
$$[a^2 = b^2] \equiv [a = b \textbf{ or } a = -b]$$
$$\left[\frac{a}{b} = 0\right] \equiv [a = 0 \textbf{ and } b \ne 0]$$
$$\left[\frac{a}{b} = \frac{c}{d}\right] \equiv [ad = bc \textbf{ and } b \ne 0 \textbf{ and } d \ne 0]$$
$$[|a| = |b|] \equiv [a = b \textbf{ or } a = -b]$$
$$[\sqrt{a} = b] \equiv [a = b^2 \textbf{ and } b \ge 0]$$

For $a \ne 0$,

$$[ax^2 + bx + c = 0] \equiv \left[x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\right]$$

Trig

$$[\cos(a) = 0] \equiv [a = (k - 1/2)\pi, k \in \mathbf{Z}]$$
$$[\sin(a) = 0] \equiv [a = k\pi, k \in \mathbf{Z}]$$
$$[\tan(a) = 0] \equiv [a = k\pi, k \in \mathbf{Z}]$$

Graphs

Cosine, sine, and tangent

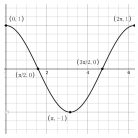


Figure 1: Graph of $y = \cos(x)$ on $[0, 2\pi]$.

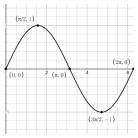


Figure 2: Graph of $y = \sin(x)$ on $[0, 2\pi]$.

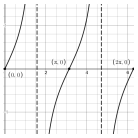


Figure 3: Graph of $y = \tan(x)$ on $[0, 2\pi]$.

Arccosine, arcsine, and arctangent

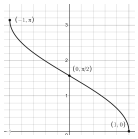


Figure 4: Graph of $y = \arccos(x)$ on $[-1, 1]$.

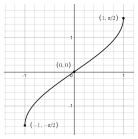


Figure 5: Graph of $y = \arcsin(x)$ on $[-1, 1]$.

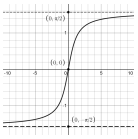


Figure 6: Graph of $y = \arctan(x)$ on $[-10, 10]$.

Unit Circle