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
pi	π or π	circular constant
phi	ϕ or φ	angle

Named Sets

empty set	$\varnothing$
real numbers	$\mathbf{R}$
ordered pairs	$\mathbf{R}^2$
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	$\Longrightarrow$
equivalent	$\equiv$
for all	$\forall$
there exists	$\exists$

Exponents

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

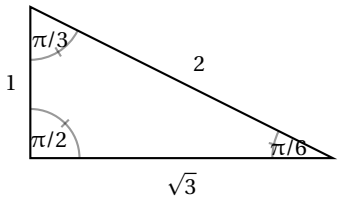
$$a^n a^m = a^{n+m}$$
$$a^n / a^m = a^{n-m}$$
$$(a^n)^m = a^{n \cdot m}$$
$$a^{-m} = 1/a^m$$
$$(a/b)^m = a^m / b^m$$

Trigonometric identities

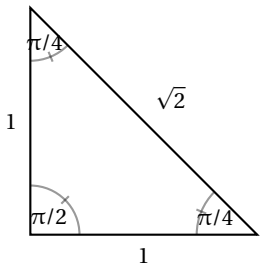
$$\sin(x)^2 + \cos(x)^2 = 1$$
$$\cos(x)^2 = \frac{1}{2}(1 + \cos(2x))$$
$$\sin(x)^2 = \frac{1}{2}(1 - \cos(2x))$$
$$\sin(x+y) = \sin(x)\cos(y) + \cos(x)\sin(y)$$
$$\cos(x+y) = \cos(x)\cos(y) - \sin(x)\sin(y)$$

Famous Triangles

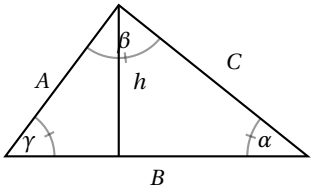
The 30-60-90 triangle



The 45-45-90 triangle



Laws of Cosine & Sine



Law of cosine

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

Law of sines

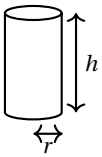
$$\frac{\sin\alpha}{A} = \frac{\sin\beta}{B} = \frac{\sin\gamma}{C}$$

Areas and volumes

$$\text{Area} = \frac{1}{2}hB = \frac{1}{2}AB\sin(\gamma)$$

Volumes

Right Circular Cylinder



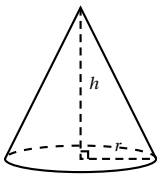
Volume

$$V = \pi r^2 h$$

Area, not including areas of circular ends

$$A = 2\pi r h$$

Cone



Volume

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

Area, not including area of circular base:

$$A = \pi r\left(r + \sqrt{r^2 + h^2}\right)$$

Solution of equations

Algebraic

$$(ab = 0) \equiv (a = 0 \vee b = 0)$$
$$(a^2 = b^2) \equiv (a = b \vee a = -b)$$
$$\left(\frac{a}{b} = 0\right) \equiv (a = 0 \wedge b \neq 0)$$
$$\left(\frac{a}{b} = \frac{c}{d}\right) \equiv (ad = bc \wedge b \neq 0 \wedge d \neq 0)$$
$$(|a| = |b|) \equiv (a = b \vee a = -b)$$
$$\left(\sqrt{a} = b\right) \equiv \left(a = b^2 \wedge b \geq 0\right)$$

Trig

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

Unit Circle