

## Astronomical and physical constants

Astronomical unit (AU)	$1.4960 \times 10^{11}$ m
Light year (ly)	$9.4605 \times 10^{15}$ m = 63 240 AU
Parsec (pc)	$3.0860 \times 10^{16}$ m = 206 265 AU
1 Sidereal year	365.2564 solar days
1 Tropical year	365.2422 solar days
1 Calendar year	365.2425 solar days
1 Sidereal day	$23^{\text{h}} 56^{\text{m}} 04^{\text{s}}.091$
1 Solar day	$24^{\text{h}} 03^{\text{m}} 56^{\text{s}}.555$ units of sidereal time
Mass of Earth	$5.9736 \times 10^{24}$ kg
Mean radius of Earth	$6.371 \times 10^6$ m
Equatorial radius of Earth	$6.378 \times 10^6$ m
Mean velocity of Earth on its orbit	$29.783$ km s <sup>-1</sup>
Mass of Moon	$7.3490 \times 10^{22}$ kg
Radius of Moon	$1.737 \times 10^6$ m
Mean Earth – Moon distance	$3.844 \times 10^8$ m
Mass of Sun	$1.98892 \times 10^{30}$ kg
Radius of Sun	$6.96 \times 10^8$ m
Effective temperature of the Sun	5780 K
Luminosity of the Sun	$3.96 \times 10^{26}$ J s <sup>-1</sup>
Solar constant	$1366$ W m <sup>-2</sup>
Brightness of the Sun in V-band	-26.8 mag.
Absolute brightness of the Sun in V-band	4.75 mag.
Absolute bolometric brightness of Sun	4.72 mag.
Angular diameter of the Sun	30'
Speed of light in vacuum (c)	$2.9979 \times 10^8$ m s <sup>-1</sup>
Gravitational constant (G)	$6.6738 \times 10^{-11}$ N m <sup>2</sup> kg <sup>-2</sup>
Boltzmann constant (k)	$1.381 \times 10^{-23}$ m kg s <sup>-2</sup> K <sup>-1</sup>
Stefan–Boltzmann constant (σ)	$5.6704 \times 10^{-8}$ kg s <sup>-3</sup> K <sup>-4</sup>
Planck constant (h)	$6.6261 \times 10^{-34}$ J s
Wien's constant (b)	$2.8978 \times 10^{-3}$ m K
Hubble constant (H <sub>0</sub> )	$70$ km s <sup>-1</sup> Mpc <sup>-1</sup>
electron charge (e)	$1.602 \times 10^{-19}$ C
Current inclination of the ecliptic (ε)	$23^{\circ} 26.3'$
Coordinates of the northern ecliptic pole for epoch 2000.0 (α <sub>E</sub> , δ <sub>E</sub> )	$18^{\text{h}} 00^{\text{m}} 00^{\text{s}}, +66^{\circ} 33.6'$
Coordinates of the northern galactic pole for epoch 2000.0 (α <sub>G</sub> , δ <sub>G</sub> )	$12^{\text{h}} 51^{\text{m}}, +27^{\circ} 08'$

You can try to solve an equation  $x = f(x)$  using iteration:  $x_{n+1} = f(x_n)$ .

Basic equations of spherical trigonometry

$$\begin{aligned} \sin a \sin B &= \sin b \sin A, \\ \sin a \cos B &= \cos b \sin c - \sin b \cos c \cos A, \\ \cos a &= \cos b \cos c + \sin b \sin c \cos A. \end{aligned}$$

