

## Calc Board 1.6.1 – Cheat Sheet

### Standard Functions

**sqrt(x)** Square Root:  $\sqrt{x}$

**rt(x; n; k)**  $n$ -th Root:  $\sqrt[k]{x}$ ,  $k = 0, \dots, n - 1$

**exp(x)** Exponential Function:  $e^x$

**ln(x)** Natural Logarithm:  $\ln(x) = \log_e(x)$

**log(x; b)** Logarithm of  $x$  to the base  $b$ :  $\log_b(x)$

**lg(x)** Common Logarithm:  $\log_{10}(x)$

**ld(x)** Binary Logarithm:  $\log_2(x)$

**lk(z; k)**  $k$ -th branch of the complex logarithm

**arg(z)** Argument of a (complex) number  $z$

**abs(z)** Absolute value of a (complex) number  $z$

**conj(z)** Complex Conjugate of  $z$

**mod(a; b)** Modulo (Remainder):  $a\%b$ , e.g.  $8\%3 = 2$

**sign(x)** Sign Function

**H(x), heaviside(x)** Heaviside Step Function

**gamma(z), gammaf(z)** Gamma Function:  $\Gamma(z)$

**max(a; b; ...), min(a; b; ...)**

**round(x)** Rounds to the nearest integer

**ceil(x) or floor(x)** Rounds to next bigger or smaller integer

**frac(x)** Returns only the part after the decimal point

**trunc(x)** Cuts off anything after the decimal point

### Stochastics

**avg(a; b; ...), mean(a; b; ...)** Arithmetic Mean

**random(min, max)** Random number between  $min$  and  $max$

**nk(n; k), comb(n; k), bincof(n; k)** Binomial Coefficient  $\binom{n}{k}$

**perm(n; k), vari(n; k)** Permutation without repetition  $(n)_k$

**binomial(n; k; p)** Binomial Distribution

### Trigonometry

**rad(x) or radpi(x)** Degrees to radians (or as multiple of  $\pi$ )

**deg(x)** Converts  $x$  from radians to degrees

**sin(x), cos(x), tan(x), csc(x), sec(x), cot(x)**

**asin(x), acos(x), atan(x), acsc(x), asec(x), acot(x)**

**sinh(x), cosh(x), tanh(x), csch(x), sech(x), coth(x)**

**asinh(x), acosh(x), atanh(x), acsch(x), asech(x), acoth(x)**

### Tensors

**delta(i; j; ...), kronecker(i; j; ...)** Kronecker- $\delta$

**levi(i; j; k; ...)** Levi-Civita:  $\epsilon_{ijk}$

### User Definitions

**alpha=90** Variable definition

**dist(x; y) : sqrt(x^2 + y^2)** Function definition

## Predefined constants

<b>ans</b>		Stores the last result
<b>pi</b>	3.141592653589793	Circular constant $\pi$
<b>E</b>	2.718281828459045	Euler's constant $e$
<b>g</b>	9.80665 m/s <sup>2</sup>	Standard gravity $g$
<b>Na</b>	6.0221418·10 <sup>23</sup> mol <sup>-1</sup>	Avogadro constant $N_A$
<b>n0</b>	2.6867773·10 <sup>25</sup> m <sup>-3</sup>	Loschmidt constant $n_0$
<b>u</b>	1.66053878·10 <sup>-27</sup> kg	Atomic mass $u$
<b>kB</b>	1.3806504·10 <sup>-23</sup> J/K	Boltzmann constant $k$
<b>R</b>	8.314472 J·mol <sup>-1</sup> ·K <sup>-1</sup>	Universal gas constant $R$
<b>Vm</b>	22.413996 l/mol	Molar gas volume $V_m$
<b>p0</b>	101 325 Pa	Standard Atmosphere $p_0$
<b>G</b>	6.674·10 <sup>-11</sup> m <sup>3</sup> ·kg <sup>-1</sup> ·s <sup>-1</sup>	Gravitational constant $G$
<b>c</b>	299 792 458 m/s	Speed of light $c$
<b>el</b>	1.60217653·10 <sup>-19</sup> C	Elementary charge $e$
<b>eps</b>	8.854188·10 <sup>-12</sup> F/m	Electric constant $\epsilon_0$
<b>m0</b>	4 $\pi$ ·10 <sup>-7</sup> N·A <sup>-2</sup>	Magnetic constant $\mu_0$
<b>F</b>	96 485.3383 C/mol	Faraday constant $F$
<b>b</b>	2.8977685·10 <sup>-3</sup> m·K	Wien's constant $b$
<b>sb</b>	5.67·10 <sup>-8</sup> W·m <sup>-2</sup> ·K <sup>4</sup>	Stefan-Boltzmann $\sigma$
<b>h</b>	6.6260693·10 <sup>-34</sup> J·s	Planck constant $h$
<b>hp</b>	1.0545717·10 <sup>-34</sup> J·s	Reduced Planck $\hbar$
<b>ryd</b>	1.0973732·10 <sup>7</sup> m <sup>-1</sup>	Rydberg constant $R_\infty$
<b>Rf</b>	3.289842·10 <sup>15</sup> Hz	Rydberg frequency $R$
<b>Ry</b>	13.6056923 eV	Rydberg energy $R_y$
<b>a0</b>	0.52917721·10 <sup>-10</sup> m	Bohr radius $a_0$
<b>mB</b>	9.274009·10 <sup>-24</sup> J/T	Bohr magneton $\mu_B$
<b>mN</b>	5.050783·10 <sup>-27</sup> J/T	Nuclear magneton $\mu_N$
<b>re</b>	2.8179403·10 <sup>-15</sup> m	Electron radius $r_e$
<b>fine</b>	7.297352568·10 <sup>-3</sup>	Fine-structure constant $\alpha$
<b>flux</b>	2.067834·10 <sup>-15</sup> V·s	Fluxon $\Phi_0$
<b>Kj</b>	483.598·10 <sup>12</sup> Hz/V	Josephson constant $K_J$
<b>ge</b>	2.0023193043718	Landé factor $g_e$ (electron)
<b>gyro</b>	2.675·10 <sup>8</sup> rad·s <sup>-1</sup> ·T <sup>-1</sup>	Gyromagnetic ratio $\gamma$
<b>Rk</b>	25 812.807449 $\Omega$	Quantum Hall resistance $R_K$

## SI prefixes

<b>Y</b>	10 <sup>24</sup>	yotta
<b>Z</b>	10 <sup>21</sup>	zetta
<b>Exa</b>	10 <sup>18</sup>	exa
<b>P</b>	10 <sup>15</sup>	peta
<b>T</b>	10 <sup>12</sup>	tera
<b>Giga</b>	10 <sup>9</sup>	giga
<b>M</b>	10 <sup>6</sup>	mega
<b>k</b>	10 <sup>3</sup>	kilo
<b>hecto</b>	10 <sup>2</sup>	hecto
<b>d</b>	10 <sup>-1</sup>	deci
<b>centi</b>	10 <sup>-2</sup>	centi
<b>m</b>	10 <sup>-3</sup>	milli
<b>micro</b>	10 <sup>-6</sup>	micro
<b>n</b>	10 <sup>-9</sup>	nano
<b>p</b>	10 <sup>-12</sup>	pico
<b>f</b>	10 <sup>-15</sup>	femto
<b>a</b>	10 <sup>-18</sup>	atto
<b>z</b>	10 <sup>-21</sup>	zepto
<b>y</b>	10 <sup>-24</sup>	yocto

## Rest masses $m_x$ and Compton wavelengths $\lambda_{C_x}$

<b>me</b>	9.109382150·10 <sup>-31</sup> kg	Electron
<b>mp</b>	1.672621637·10 <sup>-27</sup> kg	Proton
<b>mn</b>	1.674927211·10 <sup>-27</sup> kg	Neutron
<b>md</b>	3.343583200·10 <sup>-27</sup> kg	Deuteron
<b>mH</b>	1.673534000·10 <sup>-27</sup> kg	Hydrogen
<b>ma</b>	6.644656200·10 <sup>-27</sup> kg	Alpha particle
<b>mm</b>	1.883531300·10 <sup>-28</sup> kg	Muon
<b>mt</b>	3.167770000·10 <sup>-27</sup> kg	Tau-Lepton
<b>Ce</b>	2.4263102175·10 <sup>-12</sup> m	Electron
<b>Cp</b>	1.3214098555·10 <sup>-15</sup> m	Proton
<b>Cn</b>	1.3195908951·10 <sup>-15</sup> m	Neutron