

GNU Calc Reference Card

(for GNU Emacs version 30)

Starting and Stopping

start/stop standard Calc	C-x * c
start/stop X keypad Calc	C-x * k
start/stop either: C-x * *	
stop standard Calc	q
Calc tutorial	C-x * t
run Calc in other window	C-x * o
quick calculation in minibuffer	C-x * q

Getting Help

The h prefix key is Calc's analogue of C-h in Emacs.

quick summary of keys	?
describe key briefly	h c
describe key fully	h k
describe function or command	h f
read Info manual	h i or C-x * i
read full Calc summary	h s or C-x * s

Error Recovery

abort command in progress	C-g
display recent error messages	w
undo last operation	U
redo last operation	D
recall last arguments	M-RET
edit top of stack	'
reset Calc to initial state	C-x * 0 (zero)

Transferring Data

grab region from a buffer	C-x * g
grab rectangle from a buffer	C-x * r
grab rectangle, summing columns	C-x * :
grab rectangle, summing rows	C-x * -
yank data to a buffer	C-x * y

Also, try C-k/C-y or X cut and paste.

Examples

In RPN, enter numbers first, separated by RET if necessary, then type the operator. To enter a calculation in algebraic form, press the apostrophe first.

RPN style:	algebraic style:
Example: 2 RET 3 +	' 2+3 RET
Example: 2 RET 3 + 4 *	' (2+3)*4 RET
Example: 2 RET 3 RET 4 + *	' 2*(3+4) RET
Example: 3 RET 6 + Q 3 ^	' sqrt(3+6)^3 RET
Example: P 3 / n S	' sin(-pi/3) RET =

Arithmetic

add, subtract, multiply, divide	+, -, *, /
raise to a power, <i>n</i> th root	^, I ^
change sign	n
reciprocal 1/ <i>x</i>	&
square root \sqrt{x}	Q
set precision	p
round off last two digits	c 2
convert to fraction, float	c F, c f
enter using algebraic notation	', 2+3*4
refer to previous result	', 3*\$^2
refer to higher stack entries	', \$1*\$^2*2
finish alg entry without evaluating	LFD
set mode where alg entry used by default	m a

Stack Commands

Here S_n is the *n*th stack entry, and N is the size of the stack.

key	no prefix	prefix <i>n</i>	prefix - <i>n</i>
RET	copy S_1	copy $S_{1..n}$	copy S_n
LFD	copy S_2	copy S_n	copy $S_{1..n}$
DEL	delete S_1	delete $S_{1..n}$	delete S_n
M-DEL	delete S_2	delete S_n	delete $S_{1..n}$
TAB	swap $S_1 \leftrightarrow S_2$	roll S_1 to S_n	roll S_n to S_N
M-TAB	roll S_3 to S_1	roll S_n to S_1	roll S_N to S_1

With a 0 prefix, these copy, delete, or reverse the entire stack.

Display

scroll horizontally, vertically	< >, { }
home cursor	o
line numbers on/off	d 1
trail display on/off	t d
scientific notation	d s
fixed-point notation	d f
floating-point (normal) notation	d n
group digits with commas	d g

For display mode commands, H prefix prevents screen redraw and I prefix temporarily redraws top of stack.

Notations

scientific notation	6.02e23
minus sign in numeric entry	_23 or 23 n
fractions	3:4
complex numbers	(<i>x</i> , <i>y</i>)
polar complex numbers	(<i>r</i> ; <i>θ</i>)
vectors (commas optional)	[1, 2, 3]
matrices (or nested vectors)	[1, 2; 3, 4]
error forms (p key)	100 +/- 0.5
interval forms	[2 .. 5)
modulo forms (M key)	6 mod 24
HMS forms	50° 30' 0"
date forms	<Jul 4, 1992>
infinity, indeterminate	inf, nan

Scientific Functions

ln, log ₁₀ , log _b	L, H L, B
exponential e^x , 10^x	E, H E
sin, cos, tan	S, C, T
arcsin, arccos, arctan	I S, I C, I T
inverse, hyperbolic prefix keys	I, H
two-argument arctan	f T
degrees, radians modes	m d, m r
pi (π)	P
factorial, double factorial	!, k d
combinations, permutations	k c, H k c
prime factorization	k f
next prime, previous prime	k n, I k n
GCD, LCM	k g, k l
random number, shuffle	k r, k h
minimum, maximum	f n, f x
error functions erf, erfc	f e, I f e
gamma, beta functions	f g, f b
incomplete gamma, beta functions	f G, f B
Bessel J_ν , Y_ν functions	f j, f y
complex magnitude, arg, conjugate	A, G, J
real, imaginary parts	f r, f i
convert polar/rectangular	c p

Financial Functions

enter percentage	M-%
convert to percentage	c %
percentage change	b %
present value	b P
future value	b F
rate of return	b T
number of payments	b #
size of payments	b M
net present value, int. rate of return	b N, b I

Above computations assume payments at end of period. Use I prefix for beginning of period, or H for a lump sum investment.

straight-line depreciation	b S
sum-of-years'-digits	b Y
double declining balance	b D

Units

enter with units	' 55 mi/hr
convert to new units, base units	u c, u b
convert temperature units	u t
simplify units expression	u s
view units table	u v

Common units:

distance: m, cm, mm, km; in, ft, mi, mfi; point, lyr	
volume: l or L, ml; gal, qt, pt, cup, floz, tbsp, tsp	
mass: g, mg, kg, t; lb, oz, ton	
time: s or sec, ms, us, ns, min, hr, day, wk	
temperature: degC, degF, K	

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Programmer's Functions

binary, octal, hex display
 decimal, other radix display
 display leading zeros
 entering non-decimal numbers
 binary word size
 binary AND, OR, XOR
 binary DIFF, NOT
 left shift
 logical right shift
 arithmetic right shift
 integer quotient, remainder
 integer square root, logarithm
 floor, ceiling, round to integer

d 2, d 8, d 6
 d 0, d r
 d z
 16#7FFF
 b w
 b a, b o, b x
 b d, b n
 b l
 b r
 b R
 \, %
 f Q, f I
 F, I F, R

Variables

Variable names are single digits or whole words.

store to variable
 store and keep on stack
 recall from variable
 shorthands for digit variables
 unstore, exchange variable
 edit variable

s t
 s s
 s r
 t n, s n, r n
 s u, s x
 s e

Vector Operations

vector of 1, 2, ..., n
 vector of n counts from a by b
 vector of copies of a value
 concatenate into vector
 pack many stack items into vector
 unpack vector or object
 length of vector (list)
 reverse vector
 sort, grade vector
 histogram of vector data
 extract vector element
 matrix determinant, inverse
 matrix transpose, trace
 cross, dot products
 identity matrix
 extract matrix row, column
 intersection, union, diff of sets
 cardinality of set
 add vectors elementwise (i.e., map +)
 sum elements in vector (i.e., reduce +)
 sum rows in matrix
 sum columns in matrix
 sum elements, accumulate results

v x n
 C-u v x
 v b
 |
 v p
 v u
 v l
 v v
 V S, V G
 V H
 V r
 V D, &
 v t, V T
 V C, *
 v i
 v r, v c
 V ^, V V, V -
 V #
 V M +
 V R +
 V R _ +
 V R : +
 V U +

Algebra

enter an algebraic formula
 enter an equation
 symbolic (vs. numeric) mode
 fractions (vs. float) mode
 suppress evaluation of formulas
 return to default evaluation rules
 "Big" display mode
 C, Pascal, FORTRAN modes
 TeX, LaTEX, eqn modes
 Maxima
 Unformatted mode
 Normal language mode
 simplify formula
 put formula into rational form
 evaluate variables in formula
 evaluate numerically
 let variable equal a value in formula
 declare properties of variable

Common decls: pos, int, real, scalar, [a..b].

expand, collect terms
 factor, partial fractions
 polynomial quotient, remainder, GCD
 derivative, integral
 taylor series
 principal solution to equation(s)
 list of solutions
 generic solution
 apply function to both sides of eqn
 rewrite formula
 Example: a r a*b + a*c := a*(b+c)
 Example: a r sin(x)^2 := 1-cos(x)^2
 Example: a r cos(n pi) := 1 :: integer(n) :: n%2 = 0
 Example: a r [f(0) := 1, f(n) := n f(n-1) :: n > 0]
 Put rules in EvalRules to have them apply automatically.
 Put rules in AlgSimpRules to apply during a s command.
 Common markers: opt, plain, quote, eval, let, remember.

Numerical Computations

sum formula over a range
 product of formula over a range
 tabulate formula over a range
 integrate numerically over a range
 find zero of formula or equation
 find local min, max of formula
 fit data to line or curve
 mean of data in vector or variable
 median of data
 geometric mean of data
 sum, product of data
 minimum, maximum of data
 sample, pop. standard deviation

' 2x+3y^2
 ' 2x^2=18
 m s
 m f
 m O
 m D
 d B
 d C, d P, d F
 d T, d L, d E
 d X
 d U
 d N
 a s
 a n
 =
 N
 s l x=val
 s d
 a x, a c
 a f, a a
 a \, a %, a g
 a d, a i
 a t
 a S
 a P
 H a S
 a M
 a r
 a +
 a *
 a T
 a I
 a R
 a M, a X
 a F
 u M
 H u M
 u G
 u +, u *
 u N, u X
 u S, I u S

Selections

select subformula under cursor
 select n th subformula
 select more
 unselect this, all formulas
 copy indicated subformula
 delete indicated subformula
 commute selected terms
 commute term leftward, rightward
 distribute, merge selection
 isolate selected term in equation
 negate, invert term in context
 rewrite selected term

Graphics

graph function or data
 graph 3D function or data
 replot current graph
 print current graph
 add curve to graph
 set number of data points
 set line, point styles
 set log vs. linear x, y axis
 set range for x, y axis
 close graphics window

Programming

begin, end recording a macro
 replay keyboard macro
 read region as written-out macro
 if, else, endif
 equal to, less than, member of
 repeat n times, break from loop
 "for" loop: start, end; body, step
 save, restore mode settings
 query user during macro
 put finished macro on a key
 define function with formula
 edit definition
 record user-defined command permanently
 record variable value permanently
 record mode settings permanently

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 for GNU Emacs Calc.

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For more Emacs documentation, and the TeX source for this card, see
 the Emacs distribution, or <https://www.gnu.org/software/emacs>