GNU Calc Reference Card

(for GNU Emacs version 23)

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 on-line 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 =

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Arithmetic

add, subtract, multiply, divide	+, -, *, /
raise to a power, nth root	^, I ^
change sign	n
reciprocal $1/x$	&
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 nth stack entry, and N is the size of the stack.

key	*no prefix*	*prefix n*	*prefix −n*
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_n

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

Display

scroll horizontally, vertically	< >, { }
home cursor	o
line numbers on/off	d l
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	(*x*, *y*)
polar complex numbers	(*r*; *θ*)
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	5@ 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	`d 2`, `d 8`, `d 6`
decimal, other radix display	`d 0`, `d r`
display leading zeros	`d z`
entering non-decimal numbers	`16#7FFF`
binary word size	`b w`
binary AND, OR, XOR	`b a`, `b o`, `b x`
binary DIFF, NOT	`b d`, `b n`
left shift	`b l`
logical right shift	`b r`
arithmetic right shift	`b R`
integer quotient, remainder	`\`, `%`
integer square root, logarithm	`f Q`, `f I`
floor, ceiling, round to integer	`F`, `I F`, `R`

Variables

Variable names are single digits or whole words.

store to variable	`s t`
store and keep on stack	`s s`
recall from variable	`s r`
shorthands for digit variables	`t` *n*, `s` *n*, `r` *n*
unstore, exchange variable	`s u`, `s x`
edit variable	`s e`

Vector Operations

vector of 1, 2, ..., *n*	`v x` *n*
vector of *n* counts from *a* by *b*	`C-u v x`
vector of copies of a value	`v b`
concatenate into vector	`|`
pack many stack items into vector	`v p`
unpack vector or object	`v u`
length of vector (list)	`v l`
reverse vector	`v v`
sort, grade vector	`V S`, `V G`
histogram of vector data	`V H`
extract vector element	`v r`
matrix determinant, inverse	`V D`, `&`
matrix transpose, trace	`v t`, `V T`
cross, dot products	`V C`, `*`
identity matrix	`v i`
extract matrix row, column	`v r`, `v c`
intersection, union, diff of sets	`V ^`, `V V`, `V -`
cardinality of set	`V #`
add vectors elementwise (i.e., map `+`)	`V M +`
sum elements in vector (i.e., reduce `+`)	`V R +`
sum rows in matrix	`V R _ +`
sum columns in matrix	`V R : +`
sum elements, accumulate results	`V U +`

Algebra

enter an algebraic formula	`' 2x+3y^2`
enter an equation	`' 2x^2=18`
symbolic (vs. numeric) mode	`m s`
fractions (vs. float) mode	`m f`
suppress evaluation of formulas	`m O`
simplify formulas automatically	`m S`
return to default evaluation rules	`m D`
"Big" display mode	`d B`
C, Pascal, FORTRAN modes	`d C`, `d P`, `d F`
TEX, LATEX, eqn modes	`d T`, `d L`, `d E`
Maxima	`d X`
Unformatted mode	`d U`
Normal language mode	`d N`
simplify formula	`a s`
put formula into rational form	`a n`
evaluate variables in formula	`=`
evaluate numerically	`N`
let variable equal a value in formula	`s l` *x*=*val*
declare properties of variable	`s d`
Common decls: `pos`, `int`, `real`, `scalar`, [*a*..*b*].	
expand, collect terms	`a x`, `a c`
factor, partial fractions	`a f`, `a a`
polynomial quotient, remainder, GCD	`a \`, `a %`, `a g`
derivative, integral	`a d`, `a i`
taylor series	`a t`
principal solution to equation(s)	`a S`
list of solutions	`a P`
generic solution	`H a S`
apply function to both sides of eqn	`a M`
rewrite formula	`a r`
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	`a +`
product of formula over a range	`a *`
tabulate formula over a range	`a T`
integrate numerically over a range	`a I`
find zero of formula or equation	`a R`
find local min, max of formula	`a N`, `a X`
fit data to line or curve	`a F`
mean of data in vector or variable	`u M`
median of data	`H u M`
geometric mean of data	`u G`
sum, product of data	`u +`, `u *`
minimum, maximum of data	`u N`, `u X`
sample, pop. standard deviation	`u S`, `I u S`

Selections

select subformula under cursor	`j s`
select *n*th subformula	`j` *n*
select more	`j m`
unselect this, all formulas	`j u`, `j c`
copy indicated subformula	`j RET`
delete indicated subformula	`j DEL`
commute selected terms	`j C`
commute term leftward, rightward	`j L`, `j R`
distribute, merge selection	`j D`, `j M`
isolate selected term in equation	`j I`
negate, invert term in context	`j N`, `j &`
rewrite selected term	`j r`

Graphics

graph function or data	`g f`
graph 3D function or data	`g F`
replot current graph	`g p`
print current graph	`g P`
add curve to graph	`g a`
set number of data points	`g N`
set line, point styles	`g s`, `g S`
set log vs. linear *x, y* axis	`g l`, `g L`
set range for *x, y* axis	`g r`, `g R`
close graphics window	`g q`

Programming

begin, end recording a macro	`C-x (`, `C-x )`
replay keyboard macro	`X`
read region as written-out macro	`C-x * m`
if, else, endif	`Z [`, `Z :`, `Z ]`
equal to, less than, member of	`a =`, `a <`, `a {`
repeat *n* times, break from loop	`Z <`, `Z >`, `Z /`
"for" loop: start, end; body, step	`Z (`, `Z )`
save, restore mode settings	`Z ‘`, `Z ’`
query user during macro	`Z #`
put finished macro on a key	`Z K`
define function with formula	`Z F`
edit definition	`Z E`
record user-defined command permanently	`Z P`
record variable value permanently	`s p`
record mode settings permanently	`m m`

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