

# COMPLEX

Cre: real part (4s) Cim: imaginary part (4s)  Cabs: absolute value (3s) Carg: argument (11s)	<pre> 5: 4: 3: 2:   COSH(X+i*Y)   ((e^X)^2+1).COS(Y)  1:   ((e^X)^2-1).SIN(Y)   2.e^X   CRE   CIN   CABS   CARG   CSIMP   CPOLA           </pre>	<pre> 5: 4: 3:   LN(X+i*Y)   1/2 * sqrt(LN(X^2+Y^2)^2 + 4*ATAN(Y/X)^2)  2: 1:   SINH(2+i*3)   ATAN(((e^2)^2+1).SIN(3))   ((e^2)^2-1).COS(3) + n   CRE   CIN   CABS   CARG   CSIMP   CPOLA           </pre>
Csimp: simplify term to Cartesian form (7s)  Cpolar: polar form (9s)	<pre> 6: 5: 4: 3:   LN(13)   LN(2+i*3)   2   +i*ATAN(3/2)  2: 1:   ((e^X)^2-1).COS(Y)   2.e^X   SINH(X+i*Y)   ((e^X)^2+1).SIN(Y)   2.e^X   CRE   CIN   CABS   CARG   CSIMP   CPOLA           </pre>	<pre> RAD NVZ DEC C= 'X' CHOME COMPLEX3 USR  5: 4: 3: 2:   1   X+i*Y  1:   1   sqrt(X^2+Y^2)   i*ATAN(Y/X)   e   Re   Im   Abs   Arg   CSIMP   CPOLA           </pre>
Croot: complex roots (1s) Cki: from 0 to 4 (2s)  Cpower: complex power (1s)	<pre> RAD NVZ DEC C= 'X' CHOME COMPLEX3 USR  5: 4: 3: 2:   5+5.i   i*(8*k+1)*pi   5   5*sqrt(2).e  1: ((1.46055167627,.23)*   CPONE CROOT   CIN   CK0   CK1   CPlot           </pre>	<pre> RAD NVZ DEC C= 'X' CHOME COMPLEX3 USR  4: 3: 2:   i   2   3  1:   i*(4*k+1)*pi   3   e   CPONE CROOT   CIN   CK0   CK1   CPlot           </pre>
Crdeq: Cauchy Riemann diffeq (1.4s)  Cplot: plot complex roots (5s)	<pre> RAD NVZ DEC C= 'X' CHOME COMPLEX3 USR  6: 5: 4: 3: 2:   Z^2  1: {(2*X=2*X -(2*Y)=-(2*Y))}   CPOIN CRDEQ   Z-WY   WY+Z   F20   Gnex           </pre>	<p>ZOOM (X,Y) TRACE Fcn EDIT CANCEL</p>
Z->XY: substitute Z=X+i*Y, Z̄=X-i*Y (0.5s)  XY->Z: X+iY->Z (2s)	<pre> 5: 4:   1   Z  3:   1   X+i*Y   Z^1,Z^2  2: 1:   X^2+Y^2   CPOIN CRDEQ   Z-WY   WY+Z   F20   Gnex           </pre>	<pre> 5: 4:   1   X-i*Y  3:   1   Z^2  2: 1:   sqrt(X^2+Y^2)   sqrt(Z*Z̄)   CPOIN CRDEQ   Z-WY   WY+Z   F20   Gnex           </pre>
FZ0: function value (0.5s)  DerZ, IntZ: derivative, integral (1s) IabZ: definite integral	<pre> 5: 4: 3: 2: 1:   COS(Z)   (5.,-4.)   (7.75,-26.17)   CPOIN CRDEQ   Z-WY   WY+Z   F20   Gnex           </pre>	<pre> 7: 6: 5: 4: 3: 2: 1:   COS(2)*2   -(2*SIN(2)-COS(2))   2*SIN(2)+COS(2)   COS(2)*2   1+i   2+2*i   (1-2*i).e^1-i*(e^2-2*i)^2 + (i*(e^1-i)   2.e^1-i.e^2   Gridn   Der2   Int2   Der2'   Int2'   Iab2           </pre>
Z->XY: substitute Z=X+i*Y, Z̄=X-i*Y (0.5s)  XY->Z: X+iY->Z (2s)	<pre> 5: 4:   1   Z  3:   1   X+i*Y   Z^1,Z^2  2: 1:   X^2+Y^2   CPOIN CRDEQ   Z-WY   WY+Z   F20   Gnex           </pre>	<pre> 5: 4:   1   X-i*Y  3:   1   Z^2  2: 1:   sqrt(X^2+Y^2)   sqrt(Z*Z̄)   CPOIN CRDEQ   Z-WY   WY+Z   F20   Gnex           </pre>
LintZ: complex line integral (1.6s)  second example (1.7s)	<pre> 5: 4: 3: 2: 1:   1   Z   COS(t)+i*SIN(t)   0   2*pi   t   2*i*pi   Lint2   Resex   Poln   Resid   Res20   CPlot           </pre>	<pre> 5: 4: 3: 2: 1:   'Z'   T + 1/T   3   0   3   'T'   4+3*i   Lint2   Resex   Poln   Resid   Res20   CPlot           </pre>

PoleM: poles with multiplicity (1s)	<pre> 7: 6: 5: 4: 3: 2:           4       (Z+i)(Z-i)^2 1:  (-i-1 i -2)       [LInt2 Resex PoleM Resid Res20 CfLog] </pre>	<pre> 6: 5: 4: 3: 2:           4       (Z+i)(Z-i)^2 1:  {Res(-i):(-1)}       {Res(i):1}       [LInt2 Resex PoleM Resid Res20 CfLog] </pre>
Residues: (1s)	<pre> 5: 4: 3: 2:           COSH(Z)-1           Z^7 1:  Res(0): 1/720       [LInt2 Resex PoleM Resid Res20 CfLog] </pre>	<pre> 5: 4: 3: 2:           e^(2*pi*i*Z)           1-Z^3 1:  {Res(1): -1/3 Res(-(1+i*sqrt(3))/2)+       [LInt2 Resex PoleM Resid Res20 CfLog] </pre>
three residues(11s)	<pre> 5: 4: 3:           COS(Z)           1-2*SIN(Z) 2:  pi/6 1:  Res('pi/6'):-1/2       [LInt2 Resex PoleM Resid Res20 CfLog] </pre>	<pre> 6:           SIN(1/Z) 5:           Res(0): 1 4:           LN((Z+1)/(Z-1)) 3:           +oo 2:           Res(oo):(-2) 1:       [LInt2 Resex PoleM Resid Res20 CfLog] </pre>
ResZ0: residue at Z0 (3.5s)	<pre> 5: 4: 3:           COS(Z)           1-2*SIN(Z) 2:  pi/6 1:  Res('pi/6'):-1/2       [LInt2 Resex PoleM Resid Res20 CfLog] </pre>	<pre> 6:           SIN(1/Z) 5:           Res(0): 1 4:           LN((Z+1)/(Z-1)) 3:           +oo 2:           Res(oo):(-2) 1:       [LInt2 Resex PoleM Resid Res20 CfLog] </pre>
ResZ0: residue of essential singularity, at ∞ (2s)	<pre> 5: 4: 3:           COS(Z)           1-2*SIN(Z) 2:  pi/6 1:  Res('pi/6'):-1/2       [LInt2 Resex PoleM Resid Res20 CfLog] </pre>	<pre> 6:           SIN(1/Z) 5:           Res(0): 1 4:           LN((Z+1)/(Z-1)) 3:           +oo 2:           Res(oo):(-2) 1:       [LInt2 Resex PoleM Resid Res20 CfLog] </pre>
HelpCOMPLEX: help	<pre> COMPLEX: NUMBERS, TERMS, FUNCTIONS Z=X+i*Y, Z*=X-i*Y  CRx  Z + RE(Z) REAL PART CIM  Z + IM(Z) IMAGINARY PART CRbs Z + ABS(Z) ABS CRa  Z + ARG(Z) ARGUMENT Csimp Z + X+i*Y SIMPLIFY       TO CARTESIAN FORM Cpolar X+i*Y + R*EXP(i*x)       CARTESIAN + POLAR FORM Cpower Z c + Z^c COMPLEX POWER  GRAPH  OK </pre>	<pre> Croot 2 n + 2*(1/n) COMPLEX ROOT Cln 2 + LN(Z) COMPLEX LOG Ck0 2(k) k1, kJ2+2(k1), (2k)J) Ck1 2(k) n n + (2k)J...2(n)J) Cplot (Z,J) + (Z,J) POINT PLOT Cpointer (Z,J) + (Z,J) PLOT WITH       POINTERS FROM 0 TO 2J CRdeg F(Z, Z*) + Cux=Uy -Vx=UyJ       CAUCHY RIEMANN DIFFER Z+uV F(Z, Z*) + F(X+i*Y, X-i*Y) uV+2 F(X+i*Y, X-i*Y) + F(Z, Z*) F20 F(Z) 20 + F(20)  GRAPH  OK </pre>
HelpCOMPLEX: help	<pre> Grex 2 + 'SIN(Z)', EXAMPLE FOR GRIDMAP SETS PPAR Gridm F(Z, Z*), F(X, Y, i) +       GRIDMAP-PLOT DerZ F(Z) + 3Z(F) Z=X+i*Y IntZ F(Z) + /FdZ DerZ F(Z) + 3Z(F) Z*=X-i*Y IntZ F(Z) + /FdZ IabZ F(Z) a b + / (a, b, F, Z) LIntZ F(Z) Z(T) T1 T2 T + I       COMPLEX LINEINTEGRAL Resex 2 + F(Z) CHOOSEBOX WITH  GRAPH  OK </pre>	<pre> EXAMPLES PoleMult F(Z) + {p1 n1...}       POLES MULTIPLICITY       ONLY FOR RATIONAL       DENOMINATORS Residues F(Z) + F(Z) {Res(p1)...}       ALL RESIDUES OF F AT       RATIONAL POLES p, FOR       NONRATIONAL FUNCTIONS LIKE       Z=0 IN 'COS(Z)/SIN(Z)' OR       ESSENTIAL SINGULARITIES       LIKE Z=0 IN 'EXP(1/Z)'  GRAPH  OK </pre>
HelpCOMPLEX: help	<pre> THE PROGRAM ASKS YOU TO KEY IN THE SINGULARITY Z=0 NOT ALLOWED Res20 F(Z) 20 + F(Z) Res(20)       FOR ALL SINGULARITIES       (NON)ESSENTIAL OR AT 0  VIA RESIDUE THEOREM YOU GET LINE INTEGRALS OVER CLOSED CURVES AS /F(Z) dZ=2pi*Eres(zk)  CST: ? HELP CFlags Rvars Cvars  GRAPH  OK </pre>	<pre> CFlags 2 + 2 (re)set flags for       easy complex manipulations -2:const+synd -3:Function+synd -105:Exact mode on -112:i simpl. -27:X+iY-X+iY -103:complex on -119:Rigorous off -120:Silent on Rvars 2 + 2 all vars are real -128 SF Cvars 2 + 2 all vars are complex       excepted vars in CASDIR       REALASSUME {S1 S2 X Y t}  GRAPH  OK </pre>