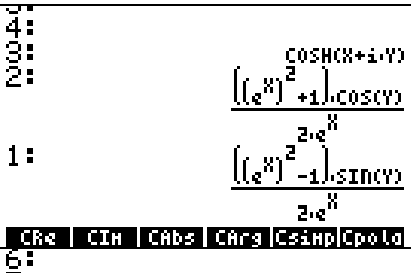
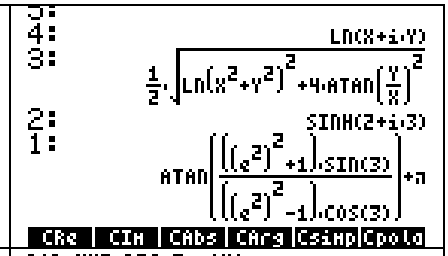
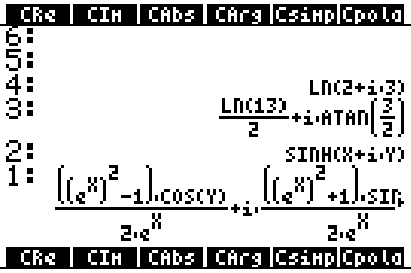
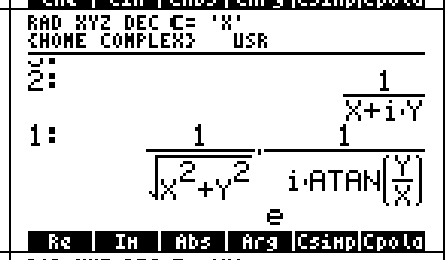
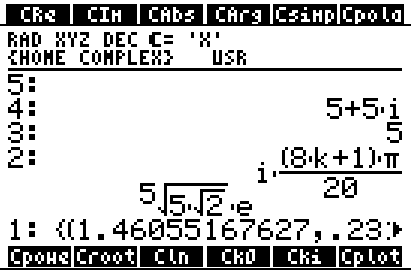
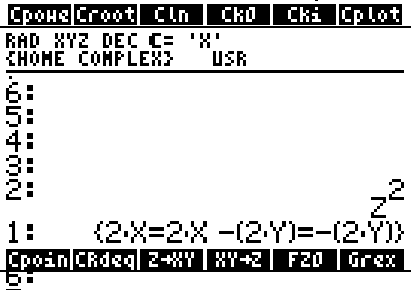
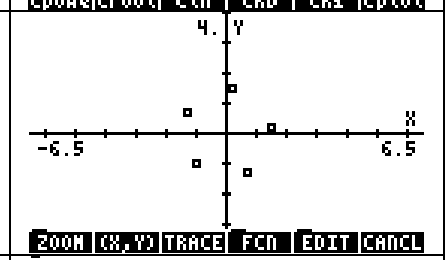
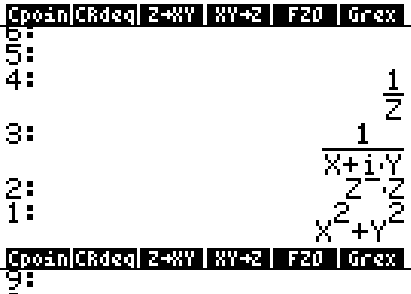
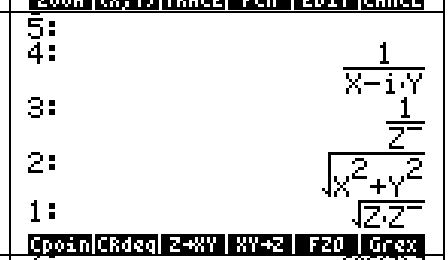
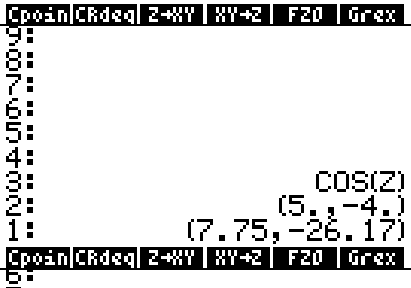
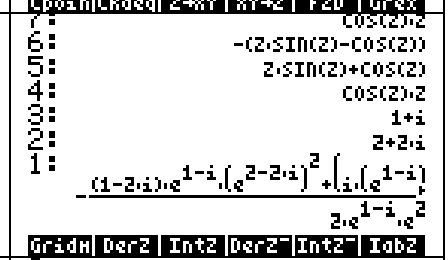
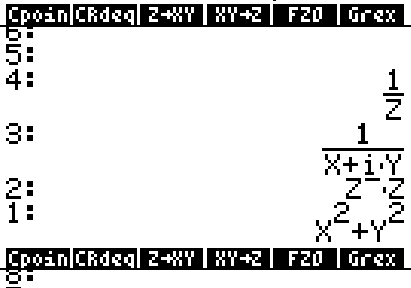
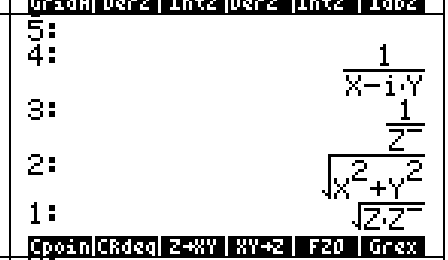
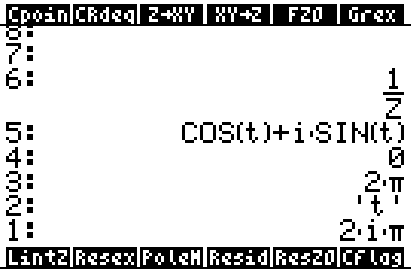
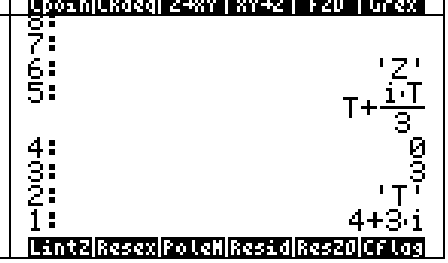
COMPLEX

Cre: real part (4s) Cim: imaginary part (4s) Cabs: absolute value (3s) Carg: argument (11s)		
Csimp: simplify term to Cartesian form (7s) Cpolar: polar form (9s)		
Croot: complex roots (1s) Cki: from 0 to 4 (2s) Cpower: complex power (1s)		
Crdeq: Cauchy Riemann diffeq (1.4s) Cplot: plot complex roots (5s)		
Z_->XY: substitute Z=X+i*Y, Z_=X-i*Y (0.5s) XY->Z: X+iY->Z (2s)		
FZ0: function value (0.5s) DerZ, IntZ: derivative, integral (1s) IabZ: definite integral		
Z_->XY: substitute Z=X+i*Y, Z_=X-i*Y (0.5s) XY->Z: X+iY->Z (2s)		
LintZ: complex line integral (1.6s) second example (1.7s)		

PoleM: poles with multiplicity (1s) Residues: (11s)	7: 6: 5: 4: 3: 2: $\frac{4}{(Z+i)\cdot(Z-i)^2}$ 1: {-i -1 i -2} Lint2 Resex PoleM Resid Res20 CFlag	6: 5: 4: 3: 2: $\frac{4}{(Z+i)\cdot(Z-i)^2}$ 1: {Res(-i):(-1) Res(i):1} Lint2 Resex PoleM Resid Res20 CFlag
Residues: (1s) three residues(11s)	6: 5: 4: 3: 2: $\frac{\mathrm{COSH}(Z)-1}{Z^7}$ 1: Res(0): $\frac{1}{720}$ Lint2 Resex PoleM Resid Res20 CFlag	5: 4: 3: 2: $\frac{e^{2\cdot\pi\cdot i\cdot Z}}{1-Z^3}$ 1: {Res(1): $\frac{-1}{3}$ Res(-((1+i×√3)/2)▸ Lint2 Resex PoleM Resid Res20 CFlag
ResZ0: residue at Z0 (3.5s) ResZ0: residue of essential singularity, at ∞ (2s)	5: 4: 3: $\frac{\mathrm{COS}(Z)}{1-2\cdot\mathrm{SIN}(Z)}$ 2: $\frac{\pi}{6}$ 1: Res('π/6'): $\frac{-1}{2}$ Lint2 Resex PoleM Resid Res20 CFlag	7: 6: $\mathrm{SIN}\left(\frac{1}{Z}\right)$ 5: 0 4: Res(0):1 3: $\mathrm{LN}\left(\frac{Z+1}{Z-1}\right)$ 2: +∞ 1: Res(∞):(-2) Lint2 Resex PoleM Resid Res20 CFlag
HelpCOMPLEX: help	COMPLEX: NUMBERS,TERMS,FUNCTIONS Z=X+i×Y, Z¯=X-i×Y CRe Z → RE(Z) REAL PART CIm Z → IM(Z) IMAGINARY PART CAbs Z → ABS(Z) ABS CArg Z → ARG(Z) ARGUMENT CsiMp Z → X+i×Y SIMPLIFY TO CARTESIAN FORM Cpolar X+i×Y → R×EXP(i×Θ) CARTESIAN → POLAR FORM Cpower Z c → Z^c COMPLEX POWER GRAPH OK	Croot Z n → Z^(1/n) COMPLEX ROOT Cln Z → LN(Z) COMPLEX LOG CK0 Z(k) k1,{k,j}→Z(k1),{Z(k,j)} Cki Z(k) m n → {Z(m)..Z(n)} Cplot {Z,j} → {Z,j} POINT PLOT Cpointer {Z,j} → {Z,j} PLOT WITH POINTERS FROM 0 TO Zj CRdeq F(Z,Z¯) → {Ux=Vy -Vx=Uy} CAUCHY RIEMANN DIFFEQ Z→XY F(Z,Z¯) → F(X+i×Y,X-i×Y) XY→Z F(X+i×Y,X-i×Y) → F(Z,Z¯) F20 F(Z) Z0 → F(Z0) GRAPH OK
HelpCOMPLEX: help	Grex _ → 'SIN(Z)', EXAMPLE FOR GRIDMAP SETS PPAR GridM F(Z,Z¯),F(X,Y,i) → GRIDMAP-PLOT DerZ F(Z) → ∂Z(F) Z=X+i×Y IntZ F(Z) → ∫FdZ DerZ¯ F(Z¯) → ∂Z¯(F) Z¯=X-i×Y IntZ¯ F(Z¯) → ∫FdZ¯ IgbZ F(Z) a b → ∫(a,b,F,Z) LintZ F(Z) Z(T) T1 T2 T → I COMPLEX LINEINTEGRAL Resex _ → F(Z) CHOOSEBOX WITH GRAPH OK	EXAMPLES PoleMult F(Z) → {p1 m1..} POLES MULTIPLICTY 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
HelpCOMPLEX: help	THE PROGRAM ASKS YOU TO KEY IN THE SINGULARITY Z=∞ NOT ALLOWED Res20 F(Z) Z0 → F(Z) Res(Z0) FOR ALL SINGULARITIES (NON)ESSENTIAL OR AT ∞ VIA RESIDUE THEOREM YOU GET LINE INTEGRALS OVER CLOSED CURVES AS ∫F(Z)dZ=2πi×ERes(zk) CST: { HELP CFlags Rvars Cvars GRAPH OK	CFlag _ → _ (re)set flags for easy complex manipiations -2:const→symb -3:Function→symb -105:Exact Mode on -112:i simpl. -27:X+iY→X+iY -103:complex on -119:Rigorous off -120:Silent on Rvars _ → _ all vars are real -128 SF Cvars _ → _ all vars are complex excepted vars in CASDIR REALASSUME {S1 S2 X Y t} GRAPH OK