

# ALGEBRA

<p>NUMERIC:</p> <p>Xnum: term to numerical</p> <p>Xq: num. to fractions (0.3s)</p> <p>Tval: term value (0.3s)</p> <p>Root: root at 0, near a (1.8s)</p>	<pre> 6: 5: 4: 3:      1       7 * COS(√2 * X) 2:      0.14 * COS(1.41 * X) 1:      1       7 * COS(√2 * X) Xnum   Xq   Tval   Root   Quad   Cubic </pre>	<pre> 7: 6:      SIN(B 5:      (2 3) 4:      .997494986604 3:      X^3 - X - 1 2:      1.32471795725 1: Xnum   Xq   Tval   Root   Quad   Cubic </pre>
<p>NUMERIC:</p> <p>Quad: solve quadr. equation</p> <p>Cubic: solve cubic equation</p> <p>Quartic: quartic equation (1s)</p> <p>Gcd: greatest common divisor</p> <p>Lcm: least comm. mult. (0.2s)</p>	<pre> 6: 5:      (1 2 3) 4:      {-(1+i√2) -(1-i√2)} 3:      (1 3 0 -4) 2:      {-2. -2. 1.} 1:      (1 0 -6 8 -3)       (1. 1. 1. -3.) Quart   Gcd   Lcm   Binseq   Bico   sΣ </pre>	<pre> 6: 5:      (15400 7875 4500) 4:      25 3:      (24 36 15) 2:      360 1: Quart   Gcd   Lcm   Binseq   Bico   sΣ </pre>
<p>NUMERIC:</p> <p>sΣ: symbolic sum (2s)</p> <p>sΠ: symbolic product (2s)</p> <p>nΣ: numeric sum (0.4s)</p> <p>nΠ: numeric product (0.8s)</p>	<pre> 6:      1 5:      k^2 4:      'k' 3:      1 2:      10       1362329       1270020 1:      1       13163185440000 sΠ   nΣ   nΠ   Seq   Srec   Splot </pre>	<pre> 6:      1 5:      k^2 4:      'k' 3:      1 2:      10       1.54976773117       7.5940584281E-14 1: sΠ   nΣ   nΠ   Seq   Srec   Splot </pre>
<p>NUMERIC:</p> <p>Srec: recursive sequence (3s)</p> <p>Splot: sequence plot(1s)</p>	<pre> 6: 5:      a3=a2+a1 4:      (1 1) 3:      1 2:      20 1:      (1 1 2 3 5 8 13 21 34 55) sΠ   nΣ   nΠ   Seq   Srec   Splot </pre>	
<p>NUMERIC:</p> <p>Dioph: solve diophantic equation (4s)</p> <p>S-&gt;Dio: insert solution (0.3s)</p> <p>i-&gt;n: long integer to large numeric (0.3s)</p>	<pre> 6: 5: 4:      2*x1+4*x2+3*x3=3 3:      {-(3*n1-(2*n2+3)) 2:      { 3*n1-(n2+3) 1:      { -(2*n1-3)       3=3 Dioph   Dioph   S-&gt;dio   Lxdio   i-&gt;n   VM </pre>	<pre> 6: 5: 4:      300! 3:      3.06057512216E(614.) 2:      (3.06E(614.)) 1:      2.68291635178E(3072) Dioph   Dioph   S-&gt;dio   Lxdio   i-&gt;n   VM </pre>
<p>NUMERIC:</p> <p>i-&gt;n: long integer to large numeric (3s)</p> <p>Bk: Bernoulli number (0.1s)</p> <p>Ek: Euler number (0.1s)</p>	<pre> 6: 5: 4:      3.2E(2500) 4.5E(200) 3:      1.44E(2701.) 2:      1       2       (9E(5000000)) 1:      3.E(2500000.) Dioph   Dioph   S-&gt;dio   Lxdio   i-&gt;n   VM </pre>	<pre> 6: 5: 4:      B40: -26108271849644 3:      13530 2:      E40: 148511507181149 1: Bk   Ek   Bern   Euln   Helpn   CST </pre>
<p>SYMBOLIC:</p> <p>NRExpand: nonrig. expand (1s)</p> <p>Numexpand: num. expand (0.2s)</p> <p>↑Match: in matrix, lists (0.3s)</p>	<pre> 6: 5: 4:      ASIN(SIN(X))+Y 3:      X+Y 2:      √2 * SIN(1/7 * X) 1:      1.4142 * SIN(.1428 * X) Expan   Fdist   NRExp   Numex   Texpa   RFact </pre>	<pre> 5: 4: 3:      [ X X       Y 0 ] 2:      { X X^2+1 } 1:      [ X^2+1 X^2+1       Y 0 ] Usqr   Inssqr   Ssqr   Match   AMatch   Resol </pre>
<p>SYMBOLIC:</p> <p>Fdistrib: full expansion (1s)</p> <p>Powsimp: simplify powers (0.3s)</p>	<pre> 6: 5: 4:      (X+1)^2 * (Y-2) 3:      Y * X^2 - 2 * X^2 + 2 * Y * X - 4 * X + Y - 2 2:      (A+B) * (C-D) 1:      C * A - D * A + C * B - D * B Expan   Fdist   NRExp   Numex   Texpa   RFact </pre>	<pre> 6: 5: 4:      (a^b)^c 3:      a^(c*b) 2:      a^b       a^2 1:      a^(b-2) CFact   NFrac   WFact   Rpart   Cpart   Pows </pre>

<p>SYMBOLIC: Cfactor: complex factor (0.6s)</p> <p>Rfactor: real factor (1s)</p>	<p>8: 7: 6: 5: 4: 3: 2:</p> $1: \frac{x^3+8}{(x+2)(x-(1-i\sqrt{3}))(x-(1+i\sqrt{3}))}$ <p>Cfact NRfac Vfact Bpart Cpart Pows </p>	<p>8: 7: 6: 5: 4: 3: 2: 1:</p> $1: \frac{x^3+8}{(x+2)(x^2-2x+4)}$ <p>Expan Fdist NRexp Numex Texpd RFact </p>
<p>SYMBOLIC: Vfactor: factor with respect to variable v (1s)</p> <p>Dsqr: square root to denominator (1s)</p>	<p>6: 5: 4: 3: 2: 1:</p> $1: \frac{y^2x-2yx+x}{x(y^2-2y+1)}$ <p>Cfact NRfac Vfact Bpart Cpart Pows </p>	<p>8: 7: 6: 5: 4: 3: 2: 1:</p> <p>RAD XYZ DEC C= 'X' %GEBR SYMBOLIC% USR</p> $1: \frac{b\sqrt{c}}{\frac{c}{b}\sqrt{c}}$ <p>Dsqr -Sqr Sqr PMatd AMatd Resolv </p>
<p>SYMBOLIC: T→V: term to variables (1s) T→(I)DV: term to (in)-dependent variables (1s) Axrpn: algebraic to RPN and back (0.4s)</p>	<p>8: 7: 6: 5: 4: 3: 2: 1:</p> $1: \frac{F(X,Y)G(Z)}{\{F G X Y Z\}}$ <p>T→DV  Axrpn NegFr ExpFr DenFr NumFr </p>	<p>8: 7: 6: 5: 4: 3: 2: 1:</p> $1: \frac{\sin(\sqrt{X}Y)}{\{X \sqrt{Y} * \sin\}}$ <p>T→DV  Axrpn NegFr ExpFr DenFr NumFr </p>
<p>SYMBOLIC: Negfrac: negate fraction</p> <p>Expfrac: with factor, after EVAL</p>	<p>6: 5: 4: 3: 2: 1:</p> $1: \frac{\frac{A-B}{C-D}}{\frac{B-A}{D-C}}$ <p>T→DV  Axrpn NegFr ExpFr DenFr NumFr </p>	<p>6: 5: 4: 3: 2: 1:</p> $1: \frac{\frac{x-i-1}{x-i+1}}{\frac{x+i}{x-i}}$ <p>T→DV  Axrpn NegFr ExpFr DenFr NumFr </p>
<p>SYMBOLIC: Denfract: denominator Numfract: numerator</p> <p>Trexpand: expand trigo. term with integer n (0.9s)</p>	<p>6: 5: 4: 3: 2: 1:</p> $1: \frac{A}{B} \frac{A}{B} \frac{A}{B}$ <p>T→DV  Axrpn NegFr ExpFr DenFr NumFr </p>	<p>6: 5: 4: 3: 2: 1:</p> $1: \frac{\cos(n\pi)}{(-1)^n} \cos(2\pi n) e^{i\pi n} (-1)^n$ <p>Prime Trexp Edit MULTI Helps  CST</p>
<p>RATFCT: L↔R: list to rational function (0.3s)</p> <p>Radd: add rational functions Rsub: subtract rat. fct. (2.5s)</p>	<p>6: 5: 4: 3: 2: 1:</p> $1: \frac{\langle\langle 1 \ 2 \rangle \langle 1 \ 2 \ 3 \rangle\rangle}{x^2+2x+3}$ <p>Rex   Rex   L↔R   Radd   Rsub   Rmul</p>	<p>8: 7: 6: 5: 4: 3: 2: 1:</p> $1: \langle\langle 1 \ 2 \rangle \langle 1 \ 2 \ 3 \rangle\rangle \langle\langle 1 \ 2 \ 3 \rangle\rangle \langle\langle 1 \ 4 \ 10 \ 13 \ 11 \rangle \langle 1 \ 2 \ 3 \rangle\rangle \langle\langle -1 \ -4 \ -10 \ -11 \ -7 \rangle \langle 1 \ 2 \ 3 \rangle\rangle$ <p>Rex   Rex   L↔R   Radd   Rsub   Rmul</p>
<p>RATFCT: Rmul: multiply rational functions (1s)</p> <p>Rdiv: divide rational functions (1s)</p>	<p>6: 5: 4: 3: 2: 1:</p> $1: \frac{\langle\langle a \rangle \langle 1 \ 2 \rangle\rangle}{\langle\langle \frac{2a}{2} \ 2a \ 3a \rangle \langle 1 \ 2 \rangle\rangle}$ <p>Rex   Rex   L↔R   Radd   Rsub   Rmul</p>	<p>8: 7: 6: 5: 4: 3: 2: 1:</p> $1: \langle\langle 1 \ 2 \rangle \langle 1 \ 2 \ 3 \rangle\rangle \langle\langle 1 \ 2 \ 3 \rangle\rangle \langle\langle 1 \ 2 \rangle \langle 1 \ 4 \ 10 \ 12 \ 9 \rangle\rangle$ <p>Rdiv   Rmul   Rpart Rroot Rcoef Rval </p>
<p>RATFCT: Rroot: roots of numerator and denominator (0.3s) Rcoeff: roots to rat. fct. (1s)</p> <p>Reval: function values (1s)</p>	<p>8: 7: 6: 5: 4: 3: 2: 1:</p> $1: \langle\langle -2.3 \rangle \langle\langle -1.,1.41 \rangle \langle -1.,-1.41 \rangle\rangle \langle\langle 1 \ -3 \ 2 \rangle \langle 1 \ -6 \ 11 \ -6 \rangle\rangle$ <p>Rdiv   Rmul   Rpart Rroot Rcoef Rval </p>	<p>8: 7: 6: 5: 4: 3: 2: 1:</p> $1: \langle\langle 1 \ 2 \rangle \langle 1 \ 2 \ 3 \rangle\rangle \langle\langle 4 \ 5 \ 6 \rangle\rangle \langle\langle 2 \ 7 \ 8 \rangle \langle 9 \ 38 \ 51 \rangle\rangle$ <p>Rdiv   Rmul   Rpart Rroot Rcoef Rval </p>

RATFCT: Rsimp: simplify rational functions  Rder: derivative (1.7s) Rint: integral (3.9s)	<pre> 7: 6: 5: 4: 3: 2:  {{(2 4) {1 8 24 32 16}} 1:  {{(2) {1 6 12 8}} Rsimp Rder Rint Rplot Rexp Padd </pre>	<pre> 7: 6: 5: 4: 3: 2: 1: Ln(x^2+2*x+3)+sqrt(2)*atan(sqrt(2)*x+sqrt(2)) 2 Rsimp Rder Rint Rplot Rexp Padd </pre>
HYP: Lin: hyperbolic to exp (1s)  Hlin: linearize hyperbolic (1s)	<pre> 7: 6: 5: 4: 3: 2: 1: ACOSH(X) LN(X+sqrt(X^2-1)) COSH(X) 1/2*e^X + 1/2*e^-X Lin Hlin Hexpd Hyp Hypsi Hycop </pre>	<pre> 7: 6: 5: 4: 3: 2: 1: COSH(X)^4 4*COSH(2*X)+COSH(4*X)+2 8 Lin Hlin Hexpd Hyp Hypsi Hycop </pre>
HYP: Hlin: linearize hyperbolic Hexpand: expand hyperbolic (1s)  Hyp: simplify hyperbolic (3s)	<pre> 7: 6: 5: 4: 3: 2: 1: SINH(X)^2 COSH(2*X)-1 SINH(2*X) 2*COSH(X)*SINH(X) Lin Hlin Hexpd Hyp Hypsi Hycop </pre>	<pre> 7: 6: 5: 4: 3: 2: 1: COSH(X)^4-SINH(X)^4 COSH(2*X) Lin Hlin Hexpd Hyp Hypsi Hycop </pre>
HYP: Hyp: convert to hyperbolic (1s)	<pre> 7: 6: 5: 4: 3: 2: 1: e^X SINH(X)+COSH(X) 1/2*e^X + -1/2*e^-X SINH(X) Lin Hlin Hexpd Hyp Hypsi Hycop </pre>	<pre> 7: 6: 5: 4: 3: 2: 1: LN(X+sqrt(X^2+1)) ASINH(X) SINH(X) -(i*SINH(i*X)) Lin Hlin Hexpd Hyp Hypsi Hycop </pre>
HYP: Hypsin: convert to sinh Hypcosh: convert to cosh (1s)  Hyptanh: convert to tanh (1s)	<pre> 7: 6: 5: 4: 3: 2: 1: COSH(X)^3 COSH(X)*SINH(X)^2+COSH(X) SINH(X)^4 COSH(X)^4-2*COSH(X)^2+1 Lin Hlin Hexpd Hyp Hypsi Hycop </pre>	<pre> 7: 6: 5: 4: 3: 2: 1: COSH(X)^2 -1 TANH(X)^2-1 Hyptd Tr-Hy Hy-Tr Tanh2 Ash2c Ash2s </pre>
HYP: Tr→Hy: Trig to Hyp Hy→Tr: Hyp to Trig (0.4s)  Tanh2sc: tanh to sinh,cosh (0.2s)	<pre> 7: 6: 5: 4: 3: 2: 1: SIN(X) -(i*SINH(i*X)) COSH(X) COS(i*X) Hyptd Tr-Hy Hy-Tr Tanh2 Ash2c Ash2s </pre>	<pre> 7: 6: 5: 4: 3: 2: 1: TANH(X) SINH(X) COSH(X) Hyptd Tr-Hy Hy-Tr Tanh2 Ash2c Ash2s </pre>
HYP: Ash2ch: asinh to acosh (0.1s) Ash2th: asinh to atanh (0.1s)  Ath2sh: atanh to asinh (0.1s) Ash2th: asinh to acosh (0.1s)	<pre> 7: 6: 5: 4: 3: 2: 1: ASINH(X) SIGN(X)*ACOSH(sqrt(X^2+1)) ASINH(X) ATANH(X/sqrt(X^2+1)) Hyptd Tr-Hy Hy-Tr Tanh2 Ash2c Ash2s </pre>	<pre> 7: 6: 5: 4: 3: 2: 1: ATANH(X) SIGN(X)*ASINH(X/sqrt(X^2-1)) ATANH(X) SIGN(X)*ACOSH(1/sqrt(1-X^2)) Ash2s Ash2c Ath2s Ath2c Hexpd CST </pre>