wxMaxima, predavanja

slajd 8, maxima, komandna linija

(% i1)   %pi;

(% o1) π

(% i2)   float(%pi);

(% o2)   3.141592653589793

(% i3)   ev(%pi, numer);

(% o3)   3.141592653589793

(% i4)   %e;

(% o4) $\%e$

(% i5)   float(%e);

(% o5)   2.718281828459045

(% i6)   float(%i);

(% o6) $\%i$

(% i7)   %i^2;

(% o7) -1

(% i8)   sqrt(-1);

(% o8) $\%i$

(% i9)   sin(%pi/4);

(% o9) $\dfrac{1}{\sqrt{2}}$

slajd 9, simboli, brojevi, razlomci

(% i10)   3/4;

(% o10) $\dfrac{3}{4}$

(% i11)   3.0/4;

(% o11)   0.75

(% i12)   3/4.;

(% o12) $\dfrac{3}{4}$

                                              1

(% i13)   3/4.0;

(% o13)   0.75

(% i14)   float(3/4);

(% o14)   0.75

(% i15)   ev(3/4, numer);

(% o15)   0.75

(% i16)   1/2-1/3;

(% o16) $\dfrac{1}{6}$

(% i17)   float(%);

(% o17)   0.16666666666666

(% i18)   sin(2);

(% o18) $\sin(2)$

(% i19)   sin(2.0);

(% o19)   0.9092974268256817

(% i20)   63^3;

(% o20)   250047

(% i21)   3^63;

(% o21)   1144561273430837494885949696427

(% i22)   10!;

(% o22)   3628800

(% i23)   100!;

(% o23)   933262154439441526816992388562[98$digits$]916864000000000000000000000000

(% i24)   1000!;

(% o24)   402387260077093773543702433923[2508$digits$]000000000000000000000000000000

slajd 10, problemi sa =, osnovna prepreka primeni

(% i25)   solve(2*x-8 = 2, x);

(% o25) $[x = 5]$

2

(% i26) solve(x^2-5*x=-6, x);

(% o26) $[x = 3, x = 2]$

(% i27) solve(x^2-2, x);

(% o27) $[x = -\sqrt{2}, x = \sqrt{2}]$

(% i28) a;

(% o28) a

(% i29) a: 4;

(a) 4

(% i30) a;

(% o30) 4

(% i31) a$
(% i32) a^3;

(% o32) 64

(% i33) sqrt(a);

(% o33) 2

(% i34) f(x):=x^2;

(% o34) $f(x) := x^2$

(% i35) f(3);

(% o35) 9

(% i36) f(a);

(% o36) 16

(% i37) f(b);

(% o37) b^2

slajd 11, =, % i solve

(% i38) %;

(% o38) b^2

(% i39) %i245;

(% o39) $\%i245$

3

(% **i40**)   %o245;

(% o40)   %o245

(% **i41**)   3*x+2=8;

(% o41) $3x + 2 = 8$

(% **i42**)   solve(%, x);

(% o42) $[x = 2]$

(% **i43**)   solve(y^3=27, y);

(% o43) $[y = \dfrac{3^{\frac{3}{2}}\%i - 3}{2}, y = -\dfrac{3^{\frac{3}{2}}\%i + 3}{2}, y = 3]$

(% **i44**)   solve(f(t)=64, t);

(% o44) $[t = -8, t = 8]$

slajd 12, undefinisanje

(% **i45**)   fundef(f);

(% o45) $f(x) := x^2$

(% **i46**)   remfunction(f);

(% o46) $[f]$

(% **i47**)   remfunction(all);

(% o47) $[]$

(% **i48**)   values;

(% o48) $[a]$

(% **i49**)   remvalue(a);

(% o49) $[a]$

(% **i50**)   a;

(% o50) a

(% **i51**)   a: 2;

(a)   2

(% **i52**)   b: 3;

(b)   3

4

(% i53)   values;

(% o53) $[a, b]$

(% i54)   remvalue(all);

(% o54) $[a, b]$

(% i55)   values;

(% o55) $[]$

slajd 13, kill

(% i56)   a: 4;

(a) 4

(% i57)   b: 5;

(b) 5

(% i58)   f(x):=xˆ2;

(% o58) $f(x) := x^2$

(% i59)   values;

(% o59) $[a, b]$

(% i60)   kill(b);

(% o60) $done$

(% i61)   values;

(% o61) $[a]$

(% i62)   fundef(f);

(% o62) $f(x) := x^2$

(% i63)   kill(f);

(% o63) $done$

(% i64)   b: 7;

(b) 7

(% i65)   values;

(% o65) $[a, b]$

5

(% i66)   kill(all);

(% o0)   *done*

(% i1)   values;

(% o1)   []

slajd 14, jos o funkcijama i ev

(% i2)   f(x):=x^2;

(% o2) $f(x) := x^2$

(% i3)   a: x^2;

(a) x^2

(% i4)   f(y);

(% o4) y^2

(% i5)   ev(a, x=y);

(% o5) y^2

(% i6)   f(4);

(% o6)   16

(% i7)   ev(a, x=4);

(% o7)   16

slajd 15, fpprec i bfloat

(% i8)   fpprec;

(% o8)   16

(% i9)   float(%pi);

(% o9)   3.141592653589793

(% i10)   bfloat(%pi);

(% o10)   3.14159265358979b0

(% i11)   fpprec: 50;

(fpprec)   50

(% i12)   bfloat(%pi);

(% o12)   3.1415926535897932384626433832795028841971693993751b0

(% i13)   float(%pi);

(% o13)   3.141592653589793

(% i14)   fpprec: 3;

(fpprec)   3

(% i15)   bfloat(%pi);

(% o15) $3.14b0$

(% i16)   float(%pi);

(% o16)   3.141592653589793

slajd 16, fpprintprec

(% i17)   fpprintprec;

(% o17)   0

(% i18)   float(%pi);

(% o18)   3.141592653589793

(% i19)   float(%e);

(% o19)   2.718281828459045

(% i20)   fpprintprec: 3;

(fpprintprec)   3

(% i21)   float(%pi);

(% o21)   3.14

(% i22)   float(%e);

(% o22)   2.71

(% i23)   fpprintprec: 5;

(fpprintprec)   5

(% i24)   float(%pi);

(% o24)   3.1415

(% i25)   float(%e);

(% o25)   2.7182

7

(% i26)   fpprintprec: 0;

(fpprintprec)   0

(% i27)   float(%pi);

(% o27)   3.141592653589793

(% i28)   float(%e);

(% o28)   2.718281828459045

slajd 17, expand i factor

(% i29)   expand((x+1)^2);

(% o29) $x^2 + 2x + 1$

(% i30)   expand((x+1)*(x-1));

(% o30) $x^2 - 1$

(% i31)   expand((x-3)^7);

(% o31) $x^7 - 21x^6 + 189x^5 - 945x^4 + 2835x^3 - 5103x^2 + 5103x - 2187$

(% i32)   factor(%);

(% o32) $(x - 3)^7$

(% i33)   eq: expand((x-4)*(x-5)*(x-6));

(eq) $x^3 - 15x^2 + 74x - 120$

(% i34)   solve(eq, x);

(% o34) $[x = 4, x = 5, x = 6]$

(% i35)   factor(eq);

(% o35) $(x - 6)\,(x - 5)\,(x - 4)$

(% i36)   factor(4*x^5-4*x^4-13*x^3+x^2-17*x+5);

(% o36) $(2x - 5)\,\left(x^2 + 1\right)\,\left(2x^2 + 3x - 1\right)$

(% i37)   factor(1001);

(% o37)   71113

(% i38)   factor(123412341234);

(% o38)   23713376179901

(% i39)   factor(2048);

(% o39) $$2^{11}$$

slajd 18, parcijalni razlomci, partfrac(expression, variable)

(% i40)   ex: (s^3+4*s^2+6*s+4)/(s^3+3*s^2+3*s+1);

(ex) $$\frac{s^3 + 4s^2 + 6s + 4}{s^3 + 3s^2 + 3s + 1}$$

(% i41)   factor(ex);

(% o41) $$\frac{(s + 2)\left(s^2 + 2s + 2\right)}{(s + 1)^3}$$

(% i42)   partfrac(ex, s);

(% o42) $$\frac{1}{s + 1} + \frac{1}{(s + 1)^2} + \frac{1}{(s + 1)^3} + 1$$

(% i43)   expand(%);

(% o43) $$\frac{1}{s^3 + 3s^2 + 3s + 1} + \frac{1}{s^2 + 2s + 1} + \frac{1}{s + 1} + 1$$

(% i44)   ratsimp(%);

(% o44) $$\frac{s^3 + 4s^2 + 6s + 4}{s^3 + 3s^2 + 3s + 1}$$

slajd 19, ratsimp i fullratsimp

(% i45)   kill(all);

(% o0) $$done$$

(% i1)   eq: sin(x/(x^2+x))=exp((log(x)+1)^2-log(x)^2);

(eq) $$\sin\left(\frac{x}{x^2 + x}\right) = \%e^{(\log(x)+1)^2 - \log(x)^2}$$

(% i2)   ratsimp(eq);

(% o2) $$\sin\left(\frac{1}{x + 1}\right) = \%e\,x^2$$

(% i3)   ((x-1)^(3/2)-(x+1)*sqrt(x-1))/sqrt((x-1)*(x+1));

(% o3) $$\frac{(x - 1)^{\frac{3}{2}} - \sqrt{x - 1}\,(x + 1)}{\sqrt{(x - 1)(x + 1)}}$$

(% i4)   ratsimp(%);

(% o4) $$-\frac{2\sqrt{x - 1}}{\sqrt{x^2 - 1}}$$

(% i5)   expr: (x^(a/2)+1)^2*(x^(a/2)-1)^2/(x^a-1);

(expr) $$\frac{\left(x^{\frac{a}{2}} - 1\right)^2 \left(x^{\frac{a}{2}} + 1\right)^2}{x^a - 1}$$

9

(% i6)   ratsimp(%);

(% o6)
$$\frac{x^{2a} - 2x^a + 1}{x^a - 1}$$

(% i7)   fullratsimp(%);

(% o7) $x^a - 1$

slajd 20, trigonometrija

(% i8)   cos(%pi/3);

(% o8)
$$\frac{1}{2}$$

(% i9)   sin(%pi/3);

(% o9)
$$\frac{\sqrt{3}}{2}$$

(% i10)   ev(sin(%pi/3), numer);

(% o10)   0.8660254037844386

(% i11)   float(sin(%pi/3));

(% o11)   0.8660254037844386

(% i12)   csc(45*%pi/180);

(% o12) $\sqrt{2}$

(% i13)   tan(%pi/4);

(% o13)   1

(% i14)   tan(%pi/8);

(% o14) $\tan\left(\frac{\pi}{8}\right)$

(% i15)   acos(1/2);

(% o15)
$$\frac{\pi}{3}$$

(% i16)   180/%pi*asin(sqrt(3)/2);

(% o16)   60

(% i17)   acsc(1);

(% o17)
$$\frac{\pi}{2}$$

slajd 21, trigonometrija, izrazi

10

(% i18)   ex: sin(x)^2+cos(x)^2;

(ex) $$\sin{(x)}^2 + \cos{(x)}^2$$

(% i19)   trigsimp(ex);

(% o19) $$1$$

(% i20)   kill(all);

(% o0) $$done$$

(% i1)   ex: sin(a+b);

(ex) $$\sin{(b + a)}$$

(% i2)   trigexpand(ex);

(% o2) $$\cos{(a)}\sin{(b)} + \sin{(a)}\cos{(b)}$$

(% i3)   trigrat(%);

(% o3) $$\sin{(b + a)}$$

(% i4)   ex: sin(x)^2;

(ex) $$\sin{(x)}^2$$

(% i5)   trigsimp(ex);

(% o5) $$\sin{(x)}^2$$

(% i6)   trigreduce(ex);

(% o6) $$\frac{1 - \cos{(2x)}}{2}$$

(% i7)   trigrat(ex);

(% o7) $$-\frac{\cos{(2x)} - 1}{2}$$

slajd 22, linearni sistemi jednacina 1

(% i8)   3*x+2*y=7;

(% o8) $$2y + 3x = 7$$

(% i9)   lhs(%);

(% o9) $$2y + 3x$$

(% i10)   rhs(%);

(% o10) $$0$$

11

(% i11)   rhs(%o253);

(% o11)   0

(% i12)   e1: 3*x+2*y=7;

(e1) $2y + 3x = 7$

(% i13)   lhs(e1);

(% o13) $2y + 3x$

(% i14)   rhs(e1);

(% o14)   7

(% i15)   e2: 5*x-y=3;

(e2) $5x - y = 3$

(% i16)   linsolve([e1,e2], [x,y]);

(% o16) $[x = 1, y = 2]$

(% i17)   r: %;

(r) $[x = 1, y = 2]$

(% i18)   r[1];

(% o18) $x = 1$

(% i19)   r[2];

(% o19) $y = 2$

(% i20)   rhs(r[1]);

(% o20)   1

(% i21)   rhs(r[2]);

(% o21)   2

slajd 23, linearni sistemi jednacina 2

(% i22)   e1;

(% o22) $2y + 3x = 7$

(% i23)   e1: 10*x-2*y=6;

(e1) $10x - 2y = 6$

(% i24)   e2;

(% o24)
$$5x - y = 3$$

(% i25)   linsolve([e1,e2], [x,y]);

solve: dependent equations eliminated: (2)

(% o25)
$$[x = \frac{\%r1 + 3}{5}, y = \%r1]$$

(% i26)   e1: 10*x-2*y=5;

(e1)
$$10x - 2y = 5$$

(% i27)   linsolve([e1,e2], [x,y]);

(% o27)
$$[]$$

slajd 24, eliminacija

(% i28)   remvalue(all);

(% o28)
$$[ex, bestlength, trylength, e1, e2, r]$$

(% i29)   a1: x+y+2*t=7;

(a1)
$$y + x + 2t = 7$$

(% i30)   a2: x-y-t=2;

(a2)
$$-y + x - t = 2$$

(% i31)   eliminate([a1,a2], [t]);

(% o31)
$$[-y + 3x - 11]$$

slajd 25, matrice

(% i32)   A: matrix([1,2],[2,1]);

(A)
$$\begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$$

(% i33)   B: invert(A);

(B)
$$\begin{pmatrix} -\frac{1}{3} & \frac{2}{3} \\ \frac{2}{3} & -\frac{1}{3} \end{pmatrix}$$

(% i34)   A*B;

(% o34)
$$\begin{pmatrix} -\frac{1}{3} & \frac{4}{3} \\ \frac{4}{3} & -\frac{1}{3} \end{pmatrix}$$

(% i35)   a*B;

(% o35)
$$\begin{pmatrix} -\frac{a}{3} & \frac{2a}{3} \\ \frac{2a}{3} & -\frac{a}{3} \end{pmatrix}$$

(% i36)   A.B;

(% o36)
$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

(% i37)   determinant(A);

(% o37)
$$-3$$

(% i38)   determinant(B);

(% o38)
$$-\frac{1}{3}$$

(% i39)   b: matrix([3],[3]);

(b)
$$\begin{pmatrix} 3 \\ 3 \end{pmatrix}$$

(% i40)   x: B.b;

(x)
$$\begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

(% i41)   A.x;

(% o41)
$$\begin{pmatrix} 3 \\ 3 \end{pmatrix}$$

(% i42)   A.x-b;

(% o42)
$$\begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

(% i43)   kill(all);

(% o0)
$$done$$

slajd 26, Kronecker-Capelli

(% i1)   A: matrix([5,-1, 3],[10,-2,6]);

(A)
$$\begin{pmatrix} 5 & -1 & 3 \\ 10 & -2 & 6 \end{pmatrix}$$

(% i2)   echelon(A);

(% o2)
$$\begin{pmatrix} 1 & -\frac{1}{5} & \frac{3}{5} \\ 0 & 0 & 0 \end{pmatrix}$$

(% i3)   A[2][3]: 5;

(% o3)
$$5$$

(% i4)   A;

(% o4)
$$\begin{pmatrix} 5 & -1 & 3 \\ 10 & -2 & 5 \end{pmatrix}$$

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(% i5)   echelon(A);

(% o5)
$$\begin{pmatrix} 1 & -\frac{1}{5} & \frac{3}{5} \\ 0 & 0 & 1 \end{pmatrix}$$

slajd 27, nelinearni sistemi

(% i6)   remvalue(all);

(% o6) $[A]$

(% i7)   a1: x^2+y^2=41;

(a1) $y^2 + x^2 = 41$

(% i8)   a2: y=x+1;

(a2) $y = x + 1$

(% i9)   algsys([a1,a2],[x,y]);

(% o9) $[[x = 4, y = 5], [x = -5, y = -4]]$

(% i10)   t: solve(a1, y);

(t) $[y = -\sqrt{41 - x^2}, y = \sqrt{41 - x^2}]$

(% i11)   y1: rhs(t[1]);

(y1) $-\sqrt{41 - x^2}$

(% i12)   y2: rhs(t[2]);

(y2) $\sqrt{41 - x^2}$

(% i13)   solve(a2, y);

(% o13) $[y = x + 1]$

(% i14)   y3: rhs(solve(a2, y)[1]);

(y3) $x + 1$

slajd 28, plotovanje

(% i15)   plot2d([y1,y2,y3],[x,-10,10],[y,-15,15]);

(% o15) $[$

/tmp/maxout11052.gnuplot_ pipes

                                                      $]$

(% i16)   wxplot2d([y1,y2,y3],[x,-10,10],[y,-15,15]);

(% t16)
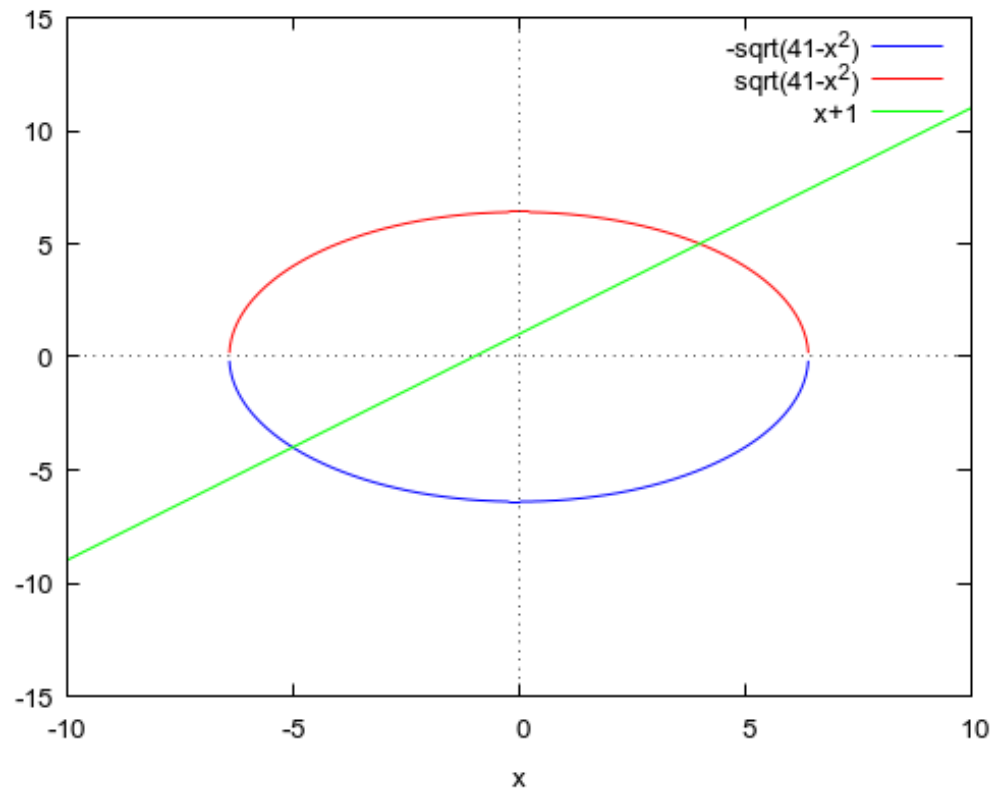
(% o16)

slajd 29, limesi

(% i17)   limit((1+1/x)^(2*x), x, inf);

(% o17) $\%e^2$

(% i18)   float(%);

(% o18)   7.38905609893065

(% i19)   (x-2)/(x^2-4);

(% o19) $\dfrac{x-2}{x^2-4}$

(% i20)   limit(%, x, 2);

(% o20) $\dfrac{1}{4}$

(% i21)   f(x):=atan(x);

(% o21) $f(x) := \operatorname{atan}(x)$

(% i22)   limit(f(x), x, inf);

(% o22) $\dfrac{\pi}{2}$

(% i23)   limit(f(x), x, minf);

(% o23)
$$-\frac{\pi}{2}$$

(% i24)   limit(x^3, x, inf);

(% o24)
$$\infty$$

(% i25)   limit(x^3, x, minf);

(% o25)
$$-\infty$$

(% i26)   limit(sin(3*x)/x, x, 0);

(% o26)
$$3$$

(% i27)   limit(sin(3*x)/x, x, inf);

(% o27)
$$0$$

(% i28)   limit(sin(3*x)/x, x, minf);

(% o28)
$$0$$

slajd 30, kombinacije . . .

(% i29)   f(x):=x^3*tan(x);

(% o29)
$$\mathrm{f}(x) := x^3 \tan(x)$$

(% i30)   rd: (f(x+h)-f(x))/h;

(rd)
$$\frac{(x+h)^3 \tan(x+h) - x^3 \tan(x)}{h}$$

(% i31)   limit(rd, h, 0);

(% o31)
$$3x^2 \tan(x) + \frac{x^3}{\cos(x)^2}$$

(% i32)   trigsimp(%);

(% o32)
$$\frac{3x^2 \cos(x) \sin(x) + x^3}{\cos(x)^2}$$

(% i33)   trigrat(%);

(% o33)
$$\frac{3x^2 \sin(2x) + 2x^3}{\cos(2x) + 1}$$

slajd 31, 0, 0- i 0+

(% i34)   limit(1/x, x, 0);

(% o34)
$$infinity$$

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(% i35) limit(1/x, x, 0, plus);

(% o35) $$\infty$$

(% i36) limit(1/x, x, 0, minus);

(% o36) $$-\infty$$

slajd 32, izvodi

(% i37) remvalue(all);

(% o37) $$[a1, a2, t, y1, y2, y3, rd, bestlength, trylength]$$

(% i38) diff(xˆ2, x);

(% o38) $$2x$$

(% i39) diff(sin(x), x);

(% o39) $$\cos{(x)}$$

(% i40) diff(sin(x), x, 2);

(% o40) $$-\sin{(x)}$$

(% i41) diff(sin(x), x, 3);

(% o41) $$-\cos{(x)}$$

(% i42) diff(sin(x), x, 4);

(% o42) $$\sin{(x)}$$

(% i43) diff(sin(x*y), x);

(% o43) $$y\cos{(xy)}$$

(% i44) diff(sin(w*t), t);

(% o44) $$w\cos{(tw)}$$

slajd 33, razvoj u red

(% i45) taylor(sin(x), x, 0, 5);

(% o45)/T $$x - \frac{x^3}{6} + \frac{x^5}{120} + ...$$

(% i46) taylor(cos(x), x, 0, 7);

(% o46)/T $$1 - \frac{x^2}{2} + \frac{x^4}{24} - \frac{x^6}{720} + ...$$

(% i47) f(x):=%eˆx-cos(x);

(% o47) $$f(x) := \%e^x - \cos{(x)}$$

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(% i48)   taylor(f(x), x, 0, 7);

(% o48)/T)
$$x + x^2 + \frac{x^3}{6} + \frac{x^5}{120} + \frac{x^6}{360} + \frac{x^7}{5040} + \ldots$$

slajd 34, integrali

(% i49)   integrate(x^2, x);

(% o49)
$$\frac{x^3}{3}$$

(% i50)   integrate(sin(x), x);

(% o50)
$$-\cos(x)$$

(% i51)   integrate(x^2, x, 1, 2);

(% o51)
$$\frac{7}{3}$$

(% i52)   integrate(sin(x), x, 0, %pi);

(% o52)
$$2$$

(% i53)   integrate(1/(1+x^2), x, 0, 1);

(% o53)
$$\frac{\pi}{4}$$

slajd 35, operator '

(% i54)   kill(all);

(% o0)
$$done$$

(% i1)   a: 4;

(a)
$$4$$

(% i2)   a;

(% o2)
$$4$$

(% i3)   'a;

(% o3)
$$a$$

(% i4)   'diff(x^2, x);

(% o4)
$$\frac{d}{dx}x^2$$

(% i5)   'integrate(x^2, x);

(% o5)
$$\int x^2 dx$$

(% i6)   ev(%, integrate);

(% o6)
$$\frac{x^3}{3}$$

(% i7)   'integrate(x^2, x, 0, 1);

(% o7)
$$\int_0^1 x^2 dx$$

(% i8)   ev(%, integrate);

(% o8)
$$\frac{1}{3}$$

slajd 36, uvod u diferencijalne jednacine

(% i9)   eq1: 'diff(y, t, 2) + 4 * y = 0;

(eq1)
$$\frac{d^2}{dt^2}y + 4y = 0$$

(% i10)   ode2(eq1, y, t);

(% o10)
$$y = \%k1 \sin(2t) + \%k2 \cos(2t)$$

(% i11)   eq2: 'diff(y, t, 2) - 4 * y = 0;

(eq2)
$$\frac{d^2}{dt^2}y - 4y = 0$$

(% i12)   ode2(eq2, y, t);

(% o12)
$$y = \%k1\,\%e^{2t} + \%k2\,\%e^{-2t}$$

(% i13)   eq3: 'diff(y, t, 2) - 2 * 'diff(y, t) + y = 0;

(eq3)
$$\frac{d^2}{dt^2}y - 2\left(\frac{d}{dt}y\right) + y = 0$$

(% i14)   ode2(eq3, y, t);

(% o14)
$$y = (\%k2\,t + \%k1)\,\%e^t$$

(% i15)   eq4: 'diff(y,t,2)+2*'diff(y,t)+4*y=8*sin(4*t);

(eq4)
$$\frac{d^2}{dt^2}y + 2\left(\frac{d}{dt}y\right) + 4y = 8\sin(4t)$$

(% i16)   ode2(eq4, y, t);

(% o16)
$$y = \%e^{-t}\left(\%k1 \sin\left(\sqrt{3}t\right) + \%k2 \cos\left(\sqrt{3}t\right)\right) - \frac{6\sin(4t) + 4\cos(4t)}{13}$$

slajd 37, provera resenja, substitute

(% i17)   eq: 'diff(y, t, 2) + y = 0;

(eq)
$$\frac{d^2}{dt^2}y + y = 0$$

(% i18)   s: ode2(eq, y, t);

(s) $$y = \%k1 \sin(t) + \%k2 \cos(t)$$

(% i19)   s: rhs(s);

(s) $$\%k1 \sin(t) + \%k2 \cos(t)$$

(% i20)   p: subst(s, y, eq);

(p) $$\frac{d^2}{dt^2}\left(\%k1 \sin(t) + \%k2 \cos(t)\right) + \%k1 \sin(t) + \%k2 \cos(t) = 0$$

(% i21)   ev(p, diff);

(% o21) $$0 = 0$$

(% i22)   is(%);

(% o22) true

slajd 38, scripting

(% i23)   batch("dj.mac");

```
read and interpret file: dj.mac
(%i24) eq1:'diff(y,t,2)+4*y = 0
(%o24) 'diff(y,t,2)+4*y=0
(%i25) ode2(eq1,y,t)
(%o25) y=%k1*sin(2*t)+%k2*cos(2*t)
(%i26) eq2:'diff(y,t,2)-4*y = 0
(%o26) 'diff(y,t,2)-4*y=0
(%i27) ode2(eq2,y,t)
(%o27) y=%k1*%e^(2*t)+%k2*%e^(-2*t)
(%i28) eq3:'diff(y,t,2)-2*'diff(y,t)+y = 0
(%o28) 'diff(y,t,2)-2*('diff(y,t,1))+y=0
(%i29) ode2(eq3,y,t)
(%o29) y=(%k2*t+%k1)*%e^t
(%i30) eq4:'diff(y,t,2)+2*'diff(y,t)+4*y = 8*sin(4*t)
(%o30) 'diff(y,t,2)+2*('diff(y,t,1))+4*y=8*sin(4*t)
(%i31) ode2(eq4,y,t)
(%o31) y=%e^(-t)*(%k1*sin(sqrt(3)*t)+%k2*cos(sqrt(3)*t))-(6*sin(4*t)+4*cos(4*t))/13
(%o31) "dj.mac"
```

slajd 39, Laplasova transformacija

(% i32)   kill(all);

(% o0) *done*

(% i1)   laplace(1, t, s);

(% o1) $$\frac{1}{s}$$

(% i2)   laplace(sin(w*t), t, s);

(% o2) $$\frac{w}{w^2 + s^2}$$

(% i3)   laplace(cos(w*t), t, s);

(% o3)
$$\frac{s}{w^2 + s^2}$$

(% i4)   laplace(exp(a*t), t, s);

(% o4)
$$\frac{1}{s - a}$$

(% i5)   laplace(exp(a*t)*sin(w*t), t, s);

(% o5)
$$\frac{w}{w^2 + s^2 - 2as + a^2}$$

(% i6)   laplace(exp(a*t)*cos(w*t), t, s);

(% o6)
$$\frac{s - a}{w^2 + s^2 - 2as + a^2}$$

(% i7)   laplace(exp(t-T), t, s);

(% o7)
$$\frac{\%e^{-T}}{s - 1}$$

slajd 40, inverzna Laplasova transformacija

(% i8)   ilt(1/(s+2), s, t);

(% o8)
$$\%e^{-2t}$$

(% i9)   ilt(2/(s^2+4), s, t);

(% o9)
$$\sin(2t)$$

(% i10)   ilt((s^2+3*s+3)/(s^3+3*s^2+3*s+1), s, t);

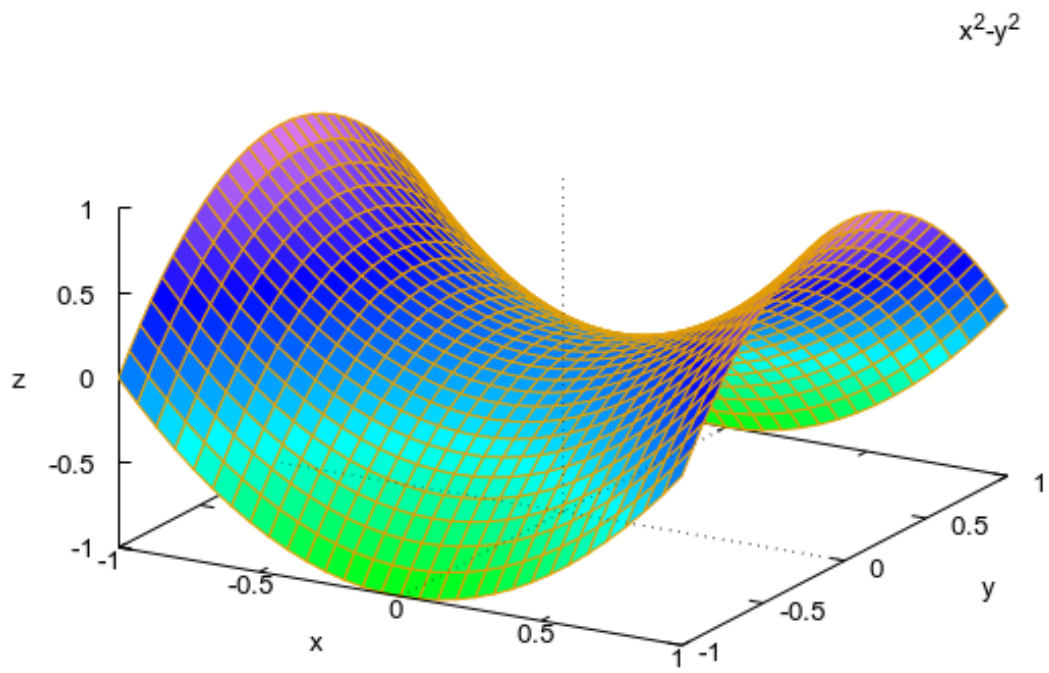(% o10)
$$\frac{t^2 \%e^{-t}}{2} + t\,\%e^{-t} + \%e^{-t}$$

slajd 40, wxMaxima

(% i11)   plot3d(x^2-y^2, [x,-1,1], [y,-1,1]);

(% o11)   [

/tmp/maxout11052.gnuplot_ pipes

                                               ]

wxplot3d(x^2-y^2, [x,-1,1], [y,-1,1]);
(% t12)

(% o12)