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) $\frac{1}{\sqrt{2}}$

slajd 9, simboli, brojevi, razlomci

```
(%i10) 3/4;
```

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

```
(%i11) 3.0/4;
```

(%o11) 0.75

```
(%i12) 3/4.;
```

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

```
(%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) $\frac{1}{6}$

```
(%i17) float(%);
```

(%o17) 0.16666666666667

```
(%i18) sin(2);
```

(%o18) $\sin(2)$

```
(%i19) sin(2.0);
```

(%o19) 0.90929742682568

```
(%i20) 63^3;
```

(%o20) 250047

```
(%i21) 3^63;
```

(%o21) 114456127343083749488594969642 7

```
(%i22) 10!;
```

(%o22) 3628800

```
(%i23) 100!;
```

(%o23) $93326215443944152681699238856 2[98digits]916864000000000000000000000000$

```
(%i24) 1000!;
```

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

slajd 10, problemi sa =, osnovna prepreka primeni

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

(%o25) $[x = 5]$

```
(%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;
```

(%o29) 4

```
(%i30) a;
```

(%o30) 4

```
(%i31) a$
```

```
(%i32) a^3;
```

(%o32) 64

```
(%i33) sqrt(a);
```

(%o33) 2

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

(%o34) $\mathrm{f}(x) := x^2$

```
(%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) %i2;
```

(%o39) $\mathrm{float}(\pi)$

```
(%i40) %o2;
```

(%o40) 3.141592653589793

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

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

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

(%o42) $[x=2]$

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

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

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

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

slajd 12, undefinisanje

```
(%i45) fundef(f);
```

(%o45) $\mathrm{f}\,(x):=x^2$

```
(%i46) remfunction(f);
```

(%o46) $[f]$

```
(%i47) fundef(f);
```

$fundef: nosuchfunction: f--anerror.Todebugthistry: debugmode(true);$

```
(%i48) remfunction(all);
```

(%o48) []

```
(%i49) values;
```

(%o49) $[a]$

```
(%i50) remvalue(a);
```

(%o50) $[a]$

```
(%i51) a;
```

(%o51) a

```
(%i52) a: 2;
```

(%o52) 2

```
(%i53) b: 3;
```

(%o53) 3

```
(%i54) values;
```

(%o54) $[a, b]$

```
(%i55) remvalue(all);
```

(%o55) $[a, b]$

```
(%i56) values;
```

(%o56) []

slajd 13, kill

```
(%i57) a: 4;
```

(%o57) 4

```
(%i58) b: 5;
```

(%o58) 5

```
(%i59) f(x):=x^2;
```

(%o59) $\mathrm{f}(x) := x^2$

```
(%i60) values;
```

(%o60) $[a, b]$

```
(%i61) kill(b);
```

(%o61) *done*

```
(%i62) values;
```

(%o62) $[a]$

```
(%i63) fundef(f);
```

(%o63) $\mathrm{f}(x) := x^2$

```
(%i64) kill(f);
```

(%o64) *done*

```
(%i65) fundef(f);
```

$fundef : nosuchfunction : f - -anerror.Todebugthistry : debugmode(true);$

```
(%i66) b: 7;
```

(%o66) 7

```
(%i67) values;
```

(%o67) $[a, b]$

```
(%i68) kill(all);
```

(%o0) *done*

```
(%i1) values;
```

(%o1) $[]$

slajd 14, jos o funkcijama i ev

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

(%o2) $\mathrm{f}(x) := x^2$

```
(%i3) a: x^2;
```

(%o3) 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) $3.1415926535897930b0$

```
(%i11) fpprec: 50;
```

(%o11) 50

```
(%i12) bfloat(%pi);
```

(%o12) $3.14159265358979323846264338327950288419716939937510b0$

```
(%i13) float(%pi);
```

(%o13) 3.141592653589793

```
(%i14) fpprec: 3;
```

(%o14) 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;
```

(%o20) 3

```
(%i21) float(%pi);
```

(%o21) 3.14

```
(%i22) float(%e);
```

(%o22) 2.72

```
(%i23) fpprintprec: 5;
```

(%o23) 5

```
(%i24) float(%pi);
```

(%o24) 3.1416

```
(%i25) float(%e);
```

(%o25) 2.7183

```
(%i26) fpprintprec: 0;
```

(%o26) 0

```
(%i27) float(%pi);
```

(%o27) 3.141592653589793

```
(%i28) float(%e);
```

(%o28) 2.718281828459045

slajd 17, expand i factor

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

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

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

(%o30) $x^2 - 1$

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

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

```
(%i32) factor(%);
```

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

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

(%o33) $x^3 - 15\,x^2 + 74\,x - 120$

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

```
(%i37) factor(1001);
```

(%o37) $7\,11\,13$

```
(%i38) factor(123412341234);
```

(%o38) $2\,3\,7\,13\,37\,617\,9901$

```
(%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);
```

(%o40) $\dfrac{s^3+4\,s^2+6\,s+4}{s^3+3\,s^2+3\,s+1}$

```
(%i41) factor(ex);
```

(%o41) $\dfrac{(s+2)\,(s^2+2\,s+2)}{(s+1)^3}$

```
(%i42) partfrac(ex, s);
```

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

```
(%i43) expand(%);
```

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

```
(%i44) ratsimp(%);
```

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

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);
```

(%o1) $\sin\left(\dfrac{x}{x^2+x}\right)=e^{(\log(x)+1)^2-\log(x)^2}$

```
(%i2)  ratsimp(eq);
```

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

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

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

```
(%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);
```

(%o5) $\frac{\left(x^{\frac{a}{2}}-1\right)^2\left(x^{\frac{a}{2}}+1\right)^2}{x^a-1}$

```
(%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) 0.86602540378444

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

(%o11) 0.86602540378444

```
(%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

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

(%o18) $\sin(x)^2 + \cos(x)^2$

```
(%i19) trigsimp(ex);
```

(%o19) 1

```
(%i20) kill(all);
```

(%o0) *done*

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

(%o1) $\sin(b+a)$

```
(%i2)  trigexpand(ex);
```

(%o2) $\cos(a)\,\sin(b) + \sin(a)\,\cos(b)$

```
(%i3)  trigrat(%);
```

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

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

(%o4) $\sin(x)^2$

```
(%i5)  trigsimp(ex);
```

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

```
(%i6)  trigreduce(ex);
```

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

```
(%i7)  trigrat(ex);
```

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

slajd 22, linearni sistemi jednacina 1

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

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

```
(%i9) lhs(%);
```

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

```
(%i10) rhs(%);
```

(%o10) 0

```
(%i11) rhs(%o9);
```

(%o11) 0

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

(%o12) $2\,y+3\,x=7$

```
(%i13) lhs(e1);
```

(%o13) $2\,y+3\,x$

```
(%i14) rhs(e1);
```

(%o14) 7

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

(%o15) $5\,x-y=3$

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

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

```
(%i17) r: %;
```

(%o17) $[x=1,y=2]$

```
(%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) $2\,y+3\,x=7$

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

(%o23) $10\,x-2\,y=6$

```
(%i24) e2;
```

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

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

$solve : dependentequationseliminated : (2)$

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

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

(%o26) $10\,x-2\,y=5$

```
(%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;
```

(%o29) $y+x+2\,t=7$

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

(%o30) $-y+x-t=2$

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

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

slajd 25, matrice

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

(%o32) $\begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$

```
(%i33) B: invert(A);
```

(%o33) $\begin{pmatrix} -\frac{1}{3} & \frac{2}{3} \\ \frac{2}{3} & -\frac{1}{3} \end{pmatrix}$

```
(%i34) A*B;
```

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

```
(%i35) a*B;
```

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

```
(%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]);
```

(%o39) $\begin{pmatrix} 3 \\ 3 \end{pmatrix}$

```
(%i40) x: B.b;
```

(%o40) $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$

```
(%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]);
```

(%o1) $\begin{pmatrix} 5 & -1 & 3 \\ 10 & -2 & 6 \end{pmatrix}$

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

```
(%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;
```

(%o7) $y^2 + x^2 = 41$

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

(%o8) $y = x + 1$

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

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

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

(%o10) $[y = -\sqrt{41 - x^2}, y = \sqrt{41 - x^2}]$

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

(%o11) $-\sqrt{41 - x^2}$

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

(%o12) $\sqrt{41 - x^2}$

```
(%i13) solve(a2, y);
```

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

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

(%o14) $x + 1$

slajd 28, plotovanje

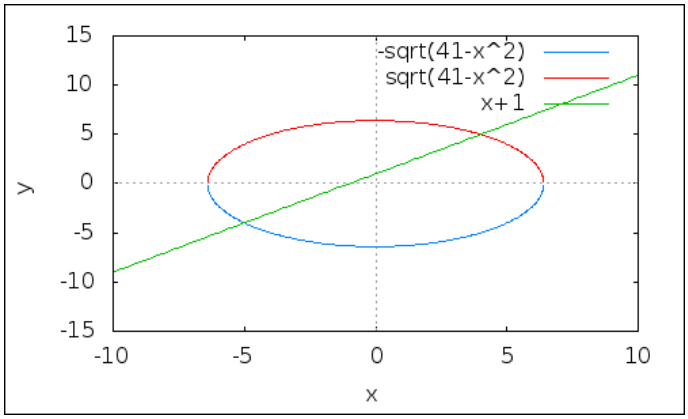
```
(%i15) plot2d([y1,y2,y3],[x,-10,10],[y,-15,15]);
```

$plot2d : expressionevaluatestonon-numericvaluesomewhereinplottingrange.plot2d : expressionevaluat$
$numericvaluesomewhereinplottingrange.$

(%o15) .

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

$plot2d : expressionevaluatestonon-numericvaluesomewhereinplottingrange.plot2d : expressionevaluat$
$numericvaluesomewhereinplottingrange.$

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

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

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

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

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

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

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

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

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

```
(%i24) limit(sin(3*x)/x, x, 0);
```

(%o24) 3

```
(%i25) limit(sin(3*x)/x, x, inf);
```

(%o25) 0

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

(%o26) 0

slajd 30, kombinacije . . .

```
(%i27) f(x):=x^3*tan(x);
```

(%o27) $\mathrm{f}(x) := x^3 \tan(x)$

```
(%i28) rd: (f(x+h)-f(x))/h;
```

(%o28) $\dfrac{(x+h)^3 \tan(x+h) - x^3 \tan(x)}{h}$

```
(%i29) limit(rd, h, 0);
```

(%o29) $3\,x^2 \tan(x) + \dfrac{x^3}{\cos(x)^2}$

```
(%i30) trigsimp(%);
```

(%o30) $\dfrac{3\,x^2 \cos(x)\,\sin(x) + x^3}{\cos(x)^2}$

```
(%i31) trigrat(%);
```

(%o31) $\dfrac{3\,x^2 \sin(2\,x) + 2\,x^3}{\cos(2\,x) + 1}$

slajd 31, 0, 0- i 0+

```
(%i32) limit(1/x, x, 0);
```

(%o32) $infinity$

```
(%i33) limit(1/x, x, 0, plus);
```

(%o33) ∞

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

(%o34) $-\infty$

slajd 32, izvodi

```
(%i35) remvalue(all);
```

(%o35) $[a1, a2, t, y1, y2, y3, rd, bestlength, trylength]$

```
(%i36) diff(x^2, x);
```

(%o36) $2\,x$

```
(%i37) diff(sin(x), x);
```

(%o37) $\cos(x)$

```
(%i38) diff(sin(x), x, 2);
```

(%o38) $-\sin(x)$

```
(%i39) diff(sin(x), x, 3);
```

(%o39) $-\cos(x)$

```
(%i40) diff(sin(x), x, 4);
```

(%o40) $\sin(x)$

```
(%i41) diff(sin(x*y), x);
```

(%o41) $y\cos(x\,y)$

```
(%i42) diff(sin(w*t), t);
```

(%o42) $w\cos(t\,w)$

slajd 33, razvoj u red

```
(%i43) taylor(sin(x), x, 0, 5);
```

(%o43) $/\!\!T\!\!/ + \frac{x^3}{6} + \frac{x^5}{120} + \ldots$

```
(%i44) taylor(cos(x), x, 0, 7);
```

(%o44) $/\!\!T\!\!/ + \frac{x^2}{2} + \frac{x^4}{24} - \frac{x^6}{720} + \ldots$

```
(%i45) f(x):=%e^x-cos(x);
```

(%o45) $\mathrm{f}(x) := e^x - \cos(x)$

```
(%i46) taylor(f(x), x, 0, 7);
```

(%o46) $/\!\!T\!\!/ + x^2 + \frac{x^3}{6} + \frac{x^5}{120} + \frac{x^6}{360} + \frac{x^7}{5040} + \ldots$

slajd 34, integrali

```
(%i47) integrate(x^2, x);
```

(%o47) $\frac{x^3}{3}$

```
(%i48) integrate(sin(x), x);
```

(%o48) $-\cos(x)$

```
(%i49) integrate(x^2, x, 1, 2);
```

(%o49) $\frac{7}{3}$

```
(%i50) integrate(sin(x), x, 0, %pi);
```

(%o50) 2

```
(%i51) integrate(1/(1+x^2), x, 0, 1);
```

(%o51) $\frac{\pi}{4}$

slajd 35, operator '

```
(%i52) kill(all);
```

(%o0) *done*

```
(%i1)  a: 4;
```

(%o1) 4

```
(%i2)  a;
```

(%o2) 4

```
(%i3)  'a;
```

(%o3) a

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

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

```
(%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;
```

(%o9) $\frac{d^2}{d\,t^2}\,y + 4\,y = 0$

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

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

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

(%o11) $\frac{d^2}{d\,t^2}\,y - 4\,y = 0$

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

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

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

(%o13) $\frac{d^2}{d\,t^2}\,y - 2\left(\frac{d}{d\,t}\,y\right) + y = 0$

```
(%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);
```

(%o15) $\frac{d^2}{d\,t^2}\,y + 2\left(\frac{d}{d\,t}\,y\right) + 4\,y = 8\sin(4\,t)$

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

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

slajd 37, provera resenja, substitute

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

(%o17) $\frac{d^2}{d\,t^2}\,y + y = 0$

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

(%o18) $y = \%k1\sin(t) + \%k2\cos(t)$

```
(%i19) s: rhs(s);
```

(%o19) $\%k1\sin(t) + \%k2\cos(t)$

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

(%o20) $\frac{d^2}{d\,t^2}\,(\%k1\sin(t)+\%k2\cos(t))+\%k1\sin(t)+\%k2\cos(t)=0$

```
(%i21) ev(p, diff);
```

(%o21) $0=0$

slajd 38, scripting

```
(%i22) batch("dj.mac");
```

$readandinterpretfile: dj.mac$

(%i23) $eq1: 4\,y+\frac{d^2}{d\,t^2}\,y=0$

(%o23) $\frac{d^2}{d\,t^2}\,y+4\,y=0$

(%i24) $\mathrm{ode2}\,(eq1,y,t)$

(%o24) $y=\%k1\sin(2\,t)+\%k2\cos(2\,t)$

(%i25) $eq2: \frac{d^2}{d\,t^2}\,y-4\,y=0$

(%o25) $\frac{d^2}{d\,t^2}\,y-4\,y=0$

(%i26) $\mathrm{ode2}\,(eq2,y,t)$

(%o26) $y=\%k1\,e^{2\,t}+\%k2\,e^{-2\,t}$

(%i27) $eq3: y-2\left(\frac{d}{d\,t}\,y\right)+\frac{d^2}{d\,t^2}\,y=0$

(%o27) $\frac{d^2}{d\,t^2}\,y-2\left(\frac{d}{d\,t}\,y\right)+y=0$

(%i28) $\mathrm{ode2}\,(eq3,y,t)$

(%o28) $y=(\%k2\,t+\%k1)\,e^{t}$

(%i29) $eq4: 4\,y+2\left(\frac{d}{d\,t}\,y\right)+\frac{d^2}{d\,t^2}\,y=8\sin(4\,t)$

(%o29) $\frac{d^2}{d\,t^2}\,y+2\left(\frac{d}{d\,t}\,y\right)+4\,y=8\sin(4\,t)$

(%i30) $\mathrm{ode2}\,(eq4,y,t)$

(%o30) $y=e^{-t}\left(\%k1\sin\left(\sqrt{3}\,t\right)+\%k2\cos\left(\sqrt{3}\,t\right)\right)-\frac{6\sin(4\,t)+4\cos(4\,t)}{13}$

(%o30) $dj.mac$

slajd 39, Laplasova transformacija

```
(%i31) 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) $\frac{w}{w^2+s^2-2\,a\,s+a^2}$

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

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

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

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

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

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

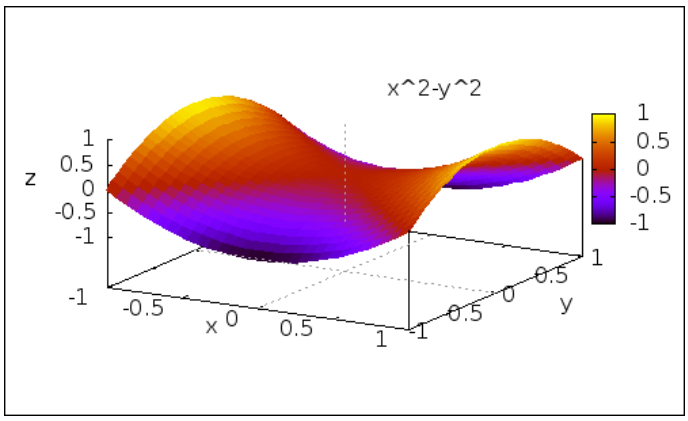
(%o10) $\frac{t^2\,e^{-t}}{2}+t\,e^{-t}+e^{-t}$

slajd 40, wxMaxima

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

(%o11) $false$

```
(%i12) wxplot3d(x^2-y^2, [x,-1,1], [y,-1,1]);
```

(%t12) 

(%o12) .