

Way to Parallel Symbolic Computations

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- Contemporary mathematics is symbolic.
- Elementary mathematical objects are not numbers, but functions, operators, functional matrices and other objects.
- Therefore the supercomputer software must support symbolical-numerical computations.

Главная страница: mathpar.com

Приложения Переход Система 1,05 GHz 25 США Чтв Май 26, 23:27

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MATHEMATICS AND PARALLEL SYMBOLIC COMPUTATIONS

Add field Page 0 < >
Current space: $Z[x,y,z]Z[u,v,w]$

```
a = (sin(5x^2))^3;  
c = a'_x;  
print(c);  
out :  
c = 30x · (sin(5x^2))^2 · cos(5x^2);
```

keyboard symbols palette

Radian UnicRing Substitution Expand run



gennady — обзор... parca - NetBeans... Корзина — обзор... Ubuntu Start Pag... Mathpar - Google... temp — обзорев... png — обзорева...

Функции одной переменной

The screenshot shows a Mozilla Firefox browser window with the following elements:

- System Tray (top):** Includes icons for applications, transition, system, and hardware (2.10GHz). The date and time are "Чтв Май 26, 23:49".
- Browser Title Bar:** "Mathpar Help - Mozilla Firefox".
- Address Bar:** "http://localhost:8084/parca/help/sections_en/mathFunction.jsp".
- Navigation:** "File Edit View History Bookmarks Tools Help" menu and navigation buttons (back, forward, home, search, refresh).
- Search:** A search bar with the Google logo and the text "Google".
- Page Content:**
 - Search Panel (left):** A blue sidebar with a "Search" button.
 - Main Content:**
 - Section Header:** "The following notations for elementary functions and constants are accepted:"
 - List of Constants:**
 - `\i` - imaginary unit,
 - `\e` - the basis of natural logarithm,
 - `\pi` - the ratio of length of a circle to its diameter,
 - Section Header:** "FUNCTIONS OF ONE ARGUMENT"
 - List of Functions:**
 - `\ln` - natural лoарифм,
 - `\lg` - decimal logarithm,
 - `\sin` - sine,
 - `\cos` - cosine,
 - `\tg` - tangent,
 - `\ctg` - cotangent,
 - `\arcsin` - arcsine,
 - `\arccos` - arccosine,
 - `\arctg` - arccotangent,
 - `\arcctg` - arcsine,
 - `\sh` - sine hyperbolic,
 - `\ch` - cosine hyperbolic,
 - `\th` - tangent hyperbolic,
 - `\cth` - cotangent hyperbolic,
 - `\arcsh` - arcsine hyperbolic,
 - `\arcch` - arccosine hyperbolic,
 - `\arcth` - arctangent hyperbolic,
 - `\arccth` - arccotangent hyperbolic,
 - `\exp` - exponent,
 - `\sqrt` - root square,
- Taskbar (bottom):** Shows several open windows: "gennady ...", "parca - N...", "Корзина ...", "Mathpar ...", "temp - ...", "png - об...", "Mathpar -...", "png - об...", "png - об...", and "S [malasch...".

Функции: \expand и \factor

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http://localhost:8084/parca/help/sections_en/function_expand_factor.jsp Google

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Decomposition and factorization of polynomials and compositions of functions:

To expand or to factorize a polynomial or an expression use the commands **\expand (f)** and **\factor (f)**.
For logarithmic and exponential functions the special commands exist

```
f = (x - y)(x + y2 + z3)2;  
g = expand(f);  
h = factor(g);  
g = expandLn(log10(10x5));  
print(f, h, g);  
out :  
f = (yz6 - xz6 + 2y3z3 - 2xy2z3 + 2xyz3 - 2x2z3 + y5 - xy4 + 2xy3 - 2x2y2 + x2y - x3);  
h = (-1 · (z3 + y2 + x)2 · (y - x));  
g = (1 + 5 · log10(x));
```

Radian UnicRing Substitution Expand

[Back on main help page](#)

Done

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Матричное обращение

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Calculating the inverse matrix:

To calculate the inverse matrix for the matrix A, to execute the `\inverse (A)`

```
SPACE = Z[x];
```

$$A = \begin{pmatrix} 1 & 4 \\ 4 & 5 \end{pmatrix};$$

```
B = inverse(A);
```

```
print(B);
```

```
out :
```

$$B = \begin{pmatrix} (-5)/11 & 4/11 \\ 4/11 & (-1)/11 \end{pmatrix};$$

Radian UnicRing Substitution Expand

```
SPACE = Z[x, y];
```

$$A = \begin{pmatrix} x+y & x \\ y & \cos(x) \end{pmatrix};$$

```
B = inverse(A);
```

```
print(B);
```

```
out :
```

$$B = \begin{pmatrix} \cos(x)/(y \cdot \cos(x) + x \cdot \cos(x) + (-xy)) & (-x/(y \cdot \cos(x) + x \cdot \cos(x) + (-xy))) \\ (-y/(y \cdot \cos(x) + x \cdot \cos(x) + (-xy))) & (y+x/(y \cdot \cos(x) + x \cdot \cos(x) + (-xy))) \end{pmatrix};$$

Radian UnicRing Substitution Expand

Done

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Решение дифф. уравнения.

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Solution of a differential equation

The solution of a linear differential equation:

Procedure of solving a differential equation consists of three parts:

- (1) to set an equation,
- (2) to set initial conditions
- (3) solving the equation.

`g = \systLDE(\d(y,t,3)+3\d(y,t,2)+3\d(y,t)+y=1)` - set the differential equation;

`f = \initCond(\d(y,t,0,0)=0, \d(y,t,0,1)=0, \d(y,t,0,2)=0)` - set the initial conditions;

`\solveLDE(g,f)` - solve the differential equation with the initial conditions.

```
SPACE = R64[t];
```

```
ZEROR64 = 8;
```

$$g = \begin{cases} \ddot{y}_t + 3\dot{y}_t + 3y_t + y = 1; \end{cases}$$

$$f = \begin{cases} y_{t=0} = 0 \end{cases}$$

$$\dot{y}_{t=0} = 0;$$

$$y_{t=0} = 0$$

```
h = solveLDE(g, f);
```

```
print(h);
```

```
out :
```

$$h = (((-t^2) \cdot e^{-t}/2, 00 + 1, 00) - (t \cdot e^{-t} + e^{-t}));$$

Radian UnicRing Substitution Expand run show formula

Done
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Решение сист. дифф. ур-ний

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```
f=\initCond(\d(x,t,0,0)=1,\d(y,t,0,0)=2,\d(z,t,0,0)=3) - set the initial conditions for the
system of differential equations;
\solveLDE(g,f)- solving SDE with the initial conditions.
```

$$SPACE = R64[t];$$
$$g = \begin{cases} x'_t - y + z = 0 \\ -x - y + y'_t = 0 \\ -x - z + z'_t = 0 \end{cases}$$
$$f = \begin{cases} x_{t=0} = 1.0 \\ y_{t=0} = 2.0; \\ z_{t=0} = 3 \end{cases}$$

```
h = solveLDE(g, f);
print(h);
out :
```

$$h = \begin{pmatrix} ((-2, 00) + 5, 00 \cdot e^{-t} + (-3, 00 \cdot e^{-t}) \cdot t) \\ (4, 00 + (-2, 00 \cdot e^{-t}) + (-12, 00 \cdot e^{-t}) \cdot t) \\ ((-2, 00) + 4, 00 \cdot e^{-t} + (-1, 00 \cdot e^{-t}) \cdot t) \end{pmatrix}$$

Radian UnicRing Substitution Expand

```
SPACE=R64[t];
a=\svstLDE(\d(x,t,2)+\d(x,t)-\d(v,t)=1,\d(x,t)+x-\d(v,t,2)=1+4\exp(t));
```

Done

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Построение графиков функций

График ф-ции: $y = \operatorname{tg}(x)$

График ф-ции: $y = \sin(x)$

График ф-ции: $y = \cos(x)$

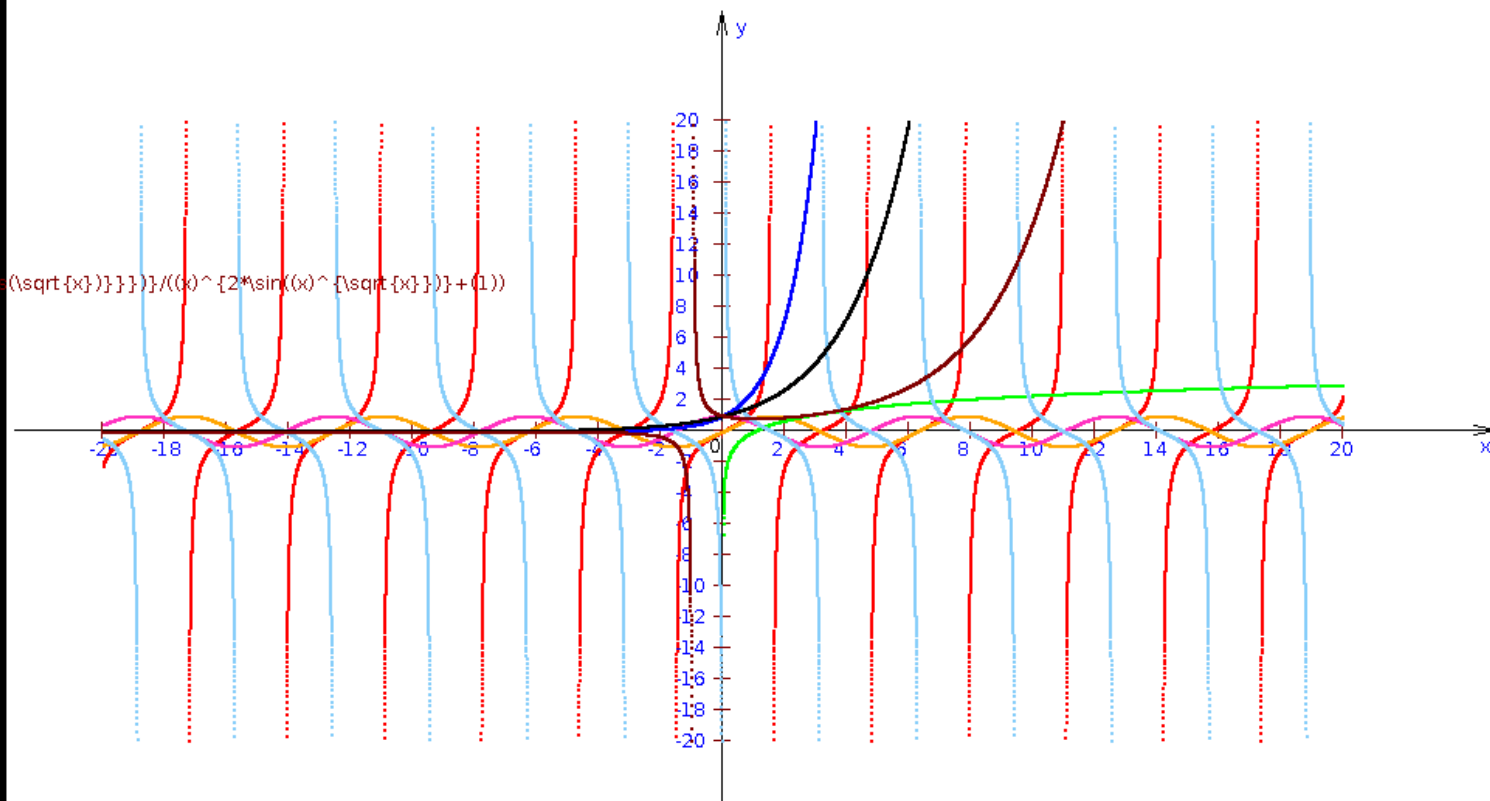
График ф-ции: $y = \ln(x)$

График ф-ции: $y = \operatorname{ctg}(x)$

График ф-ции: $y = \exp(x^{\sin(\operatorname{tg}(x))})$

График ф-ции: $y = \sqrt{\exp(x)}$

График ф-ции: $y = \sqrt{\exp(x^{\sqrt{\sin(x)^{\cos(\sqrt{x})}}}) / ((x^{2 \sin(x)^{\sqrt{x}}}) + 1)}$



Построение 3D функций

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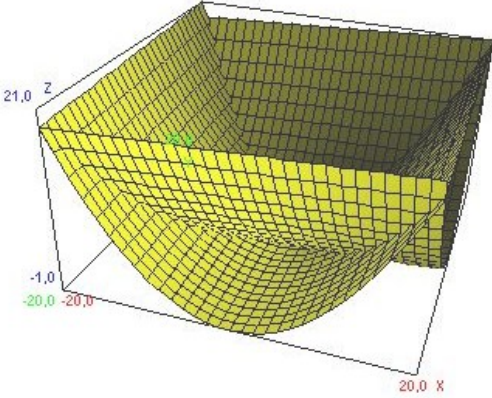
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```
plot3d([x/20 + y^2/20, x^2/20 + y/20], [-20, 20, -20, 20]);  
out :
```



Done

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