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Symbolic Math Toolbox: Quick Reference Sheet

Symbolic Variables

syms	Create symbolic variables: `syms x;` Create arrays of symbolic scalar variables: `syms M [2 3];` Create symbolic matrix variables: `syms A [2 3] matrix;`
symmatrix2sym	Convert symbolic matrix variable to array of symbolic scalar variables: `syms A B [2 3] matrix; X = A + B;` `Y = symmatrix2sym(X)`

Calculus

$\int_a^b f(x)\mathrm{d}x$

diff	Differentiation: `syms x t; diff(sin(x^2+t),x)`
int	Definite and indefinite integrals: `syms x z; int(x/(1 + z^2),z)`
release	Evaluate integrals: `syms x; F = int(cos(x),'Hold',true);` `G = release(F)`
limit	Compute limit of symbolic expression: `limit(1/x,x,0,'left')`
taylor	Taylor series: `syms x; taylor(exp(-x))`
series	Puiseux series expansion: `syms x; series(1/sin(x),x)`
symsum	Sum of a series: `syms k n; symsum(k,0,n-1)`
gradient	Gradient vector of scalar function: `syms x y z;` `gradient(x*y + 2*z*x,[x y z])`
jacobian	Jacobian matrix: `syms x y z u v;` `jacobian([x*y*z; y; x+z],[x y z])`
hessian	Hessian matrix of scalar function: `syms x y z;` `hessian(x*y + 2*z*x,[x y z])`
laplacian	Laplacian of scalar function: `syms x y z;` `laplacian(1/x + y^2 + z^3,[x y z])`
divergence	Divergence of vector field: `syms x y z;` `divergence([x^2 2*y z],[x y z])`

Algebra

π

double	Convert symbolic values to double precision: `symN = sym(pi);` `doubleN = double(symN)`
vpa	Control precision of computations with variable-precision arithmetic: `syms x;` `p = sym(pi);` `piVpa = vpa(p)`
subs	Symbolic substitution: `syms a b;` `subs(a^3+b,[a,b],[2,sym('e')])`
solve	Equations and systems solver: `syms a b u v;` `S = solve(u+v==a, u-v==b)`
dsolve	Solve differential equations: `syms y(t) a;` `eqn = diff(y,t)==a*y;` `S = dsolve(eqn)`
pdeCoefficients	Extract PDE Coefficients: `syms u(x,y);` `pdeeq = laplacian(u,[x y])== -3;` `coeffs = pdeCoefficients(pdeeq,u)`
isolate	Isolate variable or expression in equation: `syms a b c x;` `isolate(a*x^2+b*x+c==0,x)`
lhs	Left side (LHS) of equation: `syms x y;` `lhs(x^2 >= y^2)`
rhs	Right side (RHS) of equation: `syms x y;` `rhs(x^2 >= y^2)`
simplify	Algebraic simplification: `syms x;` `simplify(sin(x)^2 + cos(x)^2)`
rewrite	Rewrite expression in terms of another function: `syms x;` `rewrite(tan(x)/cos(x),'sin')`
resultant	Resultant of two polynomials: `syms x y;` `p = x^2+y;` `q = x-2*y;` `resultant(p,q)`

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Graphics

`fplot`	Plot symbolic expression or function: `syms x; f(x) = sin(x)/x; fplot(f)`
`fplot3`	Plot 3-D parametric curve: `syms x; fplot3(sin(x),cos(x),log(x))`

`fsurf`	Plot 3-D surface, mesh or contour:
	`syms x y;`
	`f(x,y)=x*exp(-x^2-y^2);`
	`fsurf(f)`

`fmesh`	Plot 3-D mesh:
	`syms x y;`
	`f(x,y)=x*exp(-x^2-y^2);`
	`fmesh(f)`

`fcontour`	Plot contours: `f(x,y)=x*exp(-x^2-y^2); fcontour(f)`

`fimplicit`, `fimplicit3`	Plot implicit symbolic equation or function:
	`syms x y;`
	`fimplicit(y^2-x^2*(x+1),[-2 2])`
	`syms x y z;`
	`fimplicit3(x^2*y*z+y^3-z^3)`

`fanimator`	Create stop-motion animation object:
	`syms y t;`
	`fanimator(@fplot,sin(x+t),[0 t]);`
	`playAnimation`

Functions

`symfun`	Create Symbolic Functions:
	`syms x y;`
	`f = symfun(x+y,[x y]); f(1,2)`

`piecewise`	Piecewise defined expression or function:
	`syms x;`
	`g(x) = piecewise(x<0,-1,x>=0,2); g(3)`

`matlabFunction`	Convert symbolic expression to function handle or file:
	`syms x y;`
	`f = sqrt(x^2 + y^2);`
	`g = matlabFunction(f)`

`matlabFunctionBlock`	Convert symbolic expression to MATLAB function block for Simulink:
	`new_system('my_system');`
	`open_system('my_system');`
	`syms x y z;`
	`f = x^2 + y^2 + z^2;`
	`matlabFunctionBlock('my_system/my_block',f)`

`simscapeEquation`	Convert symbolic expression to Simscape equations:
	`syms t x(t) y(t);`
	`phi = diff(x) + 5*y + sin(t);`
	`simscapeEquation(phi)`

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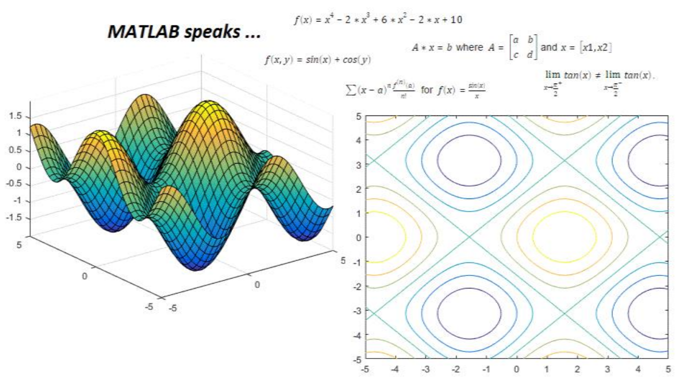

Full MATLAB cheat sheet