


Symbolic Math Toolbox: Quick Reference Sheet


x	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)

$\int_a^b f(x)dx$	Calculus
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])

π	Algebra
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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 <h3>Graphics</h3>	
fplot	Plot symbolic expression or function: <code>syms x; f(x) = sin(x)/x; fplot(f)</code>
fplot3	Plot 3-D parametric curve: <code>syms x; fplot3(sin(x),cos(x),log(x))</code>
fsurf	Plot 3-D surface, mesh or contour: <code>syms x y; f(x,y)=x*exp(-x^2-y^2); fsurf(f)</code>
fmesh	Plot 3-D mesh: <code>syms x y; f(x,y)=x*exp(-x^2-y^2); fmesh(f)</code>
fcontour	Plot contours: <code>f(x,y)=x*exp(-x^2-y^2); fcontour(f)</code>
fimplicit , fimplicit3	Plot implicit symbolic equation or function: <code>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)</code>
fanimator	Create stop-motion animation object: <code>syms y t; fanimator(@fplot,sin(x+t),[0 t]); playAnimation</code>

 <h3>Functions</h3>	
symfun	Create Symbolic Functions: <code>syms x y; f = symfun(x+y,[x y]); f(1,2)</code>
piecewise	Piecewise defined expression or function: <code>syms x; g(x) = piecewise(x<0,-1,x>=0,2); g(3)</code>
matlabFunction	Convert symbolic expression to function handle or file: <code>syms x y; f = sqrt(x^2 + y^2); g = matlabFunction(f)</code>
matlabFunctionBlock	Convert symbolic expression to MATLAB function block for Simulink: <code>new_system('my_system'); open_system('my_system'); syms x y z; f = x^2 + y^2 + z^2; matlabFunctionBlock('my_syste m/my_block',f)</code>
simscapeEquation	Convert symbolic expression to Simscape equations: <code>syms t x(t) y(t); phi = diff(x) + 5*y + sin(t); simscapeEquation(phi)</code>

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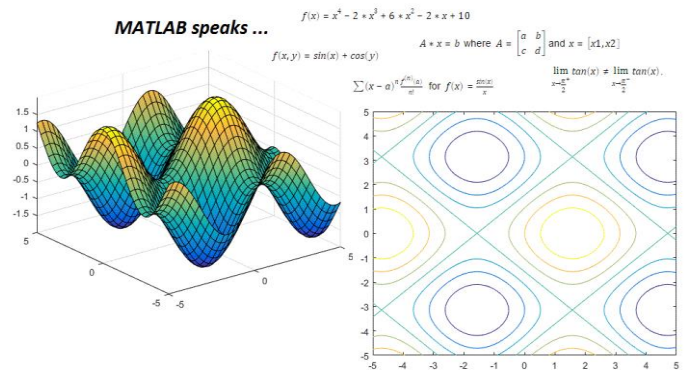
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