

SymPy — a library for symbolic mathematics in pure Python

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SymPy

- A pure Python library for symbolic mathematics

```
>>> from sympy import *
>>> x = Symbol('x')

>>> limit(sin(pi*x)/x, x, 0)
pi

>>> integrate(x + sinh(x), x)
(1/2)*x**2 + cosh(x)

>>> diff(_, x)
x + sinh(x)
```

Capabilities

What SymPy can do

- core functionality
 - differentiation, truncated series
 - pattern matching, substitutions
 - non-commutative algebras
 - assumptions engine, logic
- symbolic . . .
 - integration, summation
 - limits
- polynomial algebra
 - Gröbner bases computation
 - multivariate factorization
- matrix algebra
- equations solvers
 - algebraic, transcendental
 - recurrence, differential
- systems solvers
 - linear, polynomial
- pretty-printing
 - Unicode, ASCII
 - LaTeX, MathML
- 2D & 3D plotting
- . . .

Miscellaneous

- advantages of pure python
 - jython (sympy can be used in java applications)
 - useful for testing python implementations: 1565 tests in 139 files on 21584 lines (pypy, jython, unladen swallow)
 - google app engine
 - iphone
 - easy to deploy on windows
- easy to use in web applications
 - google app engine
 - <http://live.sympy.org/>
 - <http://gamma.sympy.org/>
- finite element solvers
 - defining equations for finite element (and other) solvers
 - generating (C/C++) shape functions (Legendre, Lobatto, ...)
 - ...
- other usages
 - calculate things symbolically, in conjunction with numerics (numpy, scipy)
 - physics (quantum mechanics, general relativity, ...)
 - teaching (calculus, numerics, ...)
 - ...