SageMath notes

by Firmin Martin

Arithmetic operation

Python-like arithmetic operations	`^`, `**`, `sqrt`, `//`, `%`, `divmod(a,b)`, `factorial(n)`, `binomial(n, k)`, *etc.*
Symbolic computation	$20/14$ give $10/7$
Numerical appoximation	`numerical_approx(20/14)` $= 1.42857$

Constants

boolean values "true" and "false"	`True`, `False`
imaginary unit i	`I` or `i`
infinity ∞	`Infinity` or `oo`
Archimedes' constant π	`pi`
logarithm basis $e = \exp(1)$	`e`
Euler-Mascheroni constant γ	`euler_gamma`
golden ratio $\phi = (1+\sqrt{5})/2$	`golden_ratio`
Catalan's constant	`catalan`

Python variables

Last three results	stored in `_`, `__` and `___` variables.
Restore predefined var default value	`restore()`
Restore all var default value	`reset()`

Symbolic variable

Declaration	`x = SR.var('x')`
Create a lot vars	`SR.var('x', 100)`
Shortcuts	`var('x')`
	`var('a, b, c, d')`

Subsitution

```
a, x = var('a, x'); y = cos(x+a) * (x+1); y
```

Substitution of symbolic var	`y.subs(a=-x)`
Parallel substitution	`y.subs(x=pi/2, a=pi/3)`
Numerical substitution	`y.subs(x=0.5, a=2.3)`
Shortcuts	`y(a=-x)`
	`y(x=pi/2, a=pi/3)`
	`y(x=0.5, a=2.3)`
Complex substitution	`f = x^3 + y^2 + z; f.substitute(x^3 == y^2, z==1)`

Function

calc

```
200 * (1.1 ^ 56)
```

sage: 41593.0113436814

```
200 * (1.02 ^ 365)
```

sage: 275481.658393215

Cheatographer

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Cheat Sheet

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Footer

FootNote