sympy_tutorial

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Part I

Tutorial de Simpy

In [2]:
```
from sympy import *
init_printing()
```

In [3]:
```
pi
```

Out [3]:
$$\pi$$

In [4]:
```
pi**2
pi.evalf()
```

Out [4]:
$$3.14159265358979$$

In [5]:
```
pi.evalf(150)
```

Out [5]:
$$3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862803482534211706$$

In [7]:
```
b=sqrt(2)
b
```

Out [7]:
$$\sqrt{2}$$

In [8]:
```
b.evalf(150)
```

Out [8]:
$$1.41421356237309504880168872420969807856967187537694807317667973799073247846210703885038753432764157$$

In [9]:
```
b**2
```

Out [9]:
$$2$$

In [10]:
```
x = Symbol('x')
y = Symbol('y')
expand((x+y)**3)
```

Out [10]:
$$x^3 + 3x^2y + 3xy^2 + y^3$$

In [11]:
```
expand(x+y, complex=True)
```

Out [11]:
$$\Re x + \Re y + i\Im x + i\Im y$$

In [12]:
```
expand(cos(x+y), trig=True)
```

Out [12]:
$$-\sin(x)\sin(y)+\cos(x)\cos(y)$$

In [13]:
```
simplify((x+x*y)/x)
```

Out [13]:
$$y+1$$

In [14]:
```
limit(sin(x)/x, x, 0)
```

Out [14]:
$$1$$

In [15]:
```
 diff(sin(x), x)
```

Out [15]:
$$\cos(x)$$

In [16]:
```
diff(sin(2*x), x)
```

Out [16]:
$$2\cos(2x)$$

In [17]:
```
diff(sin(2*x), x, 1)
```

Out [17]:
$$2\cos(2x)$$

In [18]:
```
diff(sin(2*x), x, 2)
```

Out [18]:
$$-4\sin(2x)$$

In [19]:
```
diff(sin(2*x), x, 3)
```

Out [19]:
$$-8\cos(2x)$$

In [20]:
```
series(cos(x), x,0,10)
```

Out [20]:
$$1-\frac{x^2}{2}+\frac{x^4}{24}-\frac{x^6}{720}+\frac{x^8}{40320}+\mathcal{O}\left(x^{10}\right)$$

In [21]:
```
integrate(6*x**5, x)
```

Out [21]:
$$x^6$$

In [22]:
```
diff(x**6,x)
```

Out [22]:
$$6x^5$$

In [23]:
```
integrate(sin(x), x)
```

Out [23]:
$$-\cos(x)$$

In [24]:
```
integrate(2*x + sinh(x), x)
```

Out [24]:
$$x^2+\cosh(x)$$

In [25]:
```
integrate(exp(-x**2)*erf(x), x)
```

Out [25]:
$$\frac{\sqrt{\pi}}{4}\operatorname{erf}^2(x)$$

In [26]:
```
integrate(sin(x), (x, 0, pi/2))
```

Out [26]:
$$1$$

In [27]:
```
integrate(exp(-x**2), (x, -oo, oo))
```

Out [27]:
$$\sqrt{\pi}$$

In [28]:
```
solve(x**4 - 1, x)
```

Out [28]:
$$\left[-1,\quad 1,\quad -i,\quad i\right]$$

In [29]:
```
solve([x + 5*y - 2, -3*x + 6*y - 15], [x, y])
```

Out [29]:
$$\{x : -3, \quad y : 1\}$$

In [30]:
```
solve(exp(x) + 1, x)
```

Out [30]:
$$[i\pi]$$

In [31]:
```
from sympy import Matrix
Matrix([[1,0], [0,1]])
```

Out [31]:
$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

In [32]:
```
x = Symbol('x')
y = Symbol('y')
A = Matrix([[1,x], [y,1]])
A
```

Out [32]:
$$\begin{bmatrix} 1 & x \\ y & 1 \end{bmatrix}$$

In [33]:
```
A**2
```

Out [33]:
$$\begin{bmatrix} xy + 1 & 2x \\ 2y & xy + 1 \end{bmatrix}$$

In [34]:
```
DiracDelta (x**2+x-2).simplify (x)
```

Out [34]:
$$\frac{1}{3}\delta\left(x - 1\right) + \frac{1}{3}\delta\left(x + 2\right)$$

In [35]:
```
diff(DiracDelta(x - 1)/3 + DiracDelta(x + 2)/3, x)
```

Out [35]:
$$\frac{1}{3}\delta^{(1)}\left(x - 1\right) + \frac{1}{3}\delta^{(1)}\left(x + 2\right)$$

Ecuaciones diferenciales

In [36]:
```
f, g = symbols('f g', cls=Function)
```

In [37]:
```
f(x)
```

Out [37]:
$$f(x)$$

In [38]:
```
f(x).diff(x)
```

Out [38]:
$$\frac{d}{dx}f(x)$$

In [39]:
```
diffeq = Eq(f(x).diff(x, x) - 2*f(x).diff(x) + f(x), sin(x))
diffeq
```

Out [39]:
$$f(x) - 2\frac{d}{dx}f(x) + \frac{d^2}{dx^2}f(x) = \sin\left(x\right)$$

In [40]:
```
dsolve(diffeq, f(x))
```

Out [40]:
$$f(x) = \left(C_1 + C_2 x\right)e^{x} + \frac{1}{2}\cos\left(x\right)$$

Comprobación

In [41]:
```
c1=Symbol('c1')
c2=Symbol('c2')
g0, g1, g2 = symbols('g0 g1 g2', cls=Function)
```

In [42]:
```
g0 = (c1+c2*x)*exp(x) + cos(x)/2
```

In [43]:
```
g1 = diff( (c1+c2*x)*exp(x) + cos(x)/2,x)
```

In [44]:
```
g2 = diff( (c1+c2*x)*exp(x) + cos(x)/2,x,2)
```

In [45]:
```
g0 - 2*g1  + g2
```

Out [45]:

$$\sin(x)$$

In []: