In [1]:
```
from sympy import *
```

Example 1: y'' + y = 0; y(0) = 1; y'(0) = 0

In [8]:
```
x=symbols('x')
y=Function('y')
# use dsolve with hint "2nd_power_series_ordinary": Result will be the firs
t 6 terms of the series (a0..a5)
# The O(x**6) implies that there are infinitely more terms not listed
deq=diff(y(x),x,2)-y(x)
ysoln=dsolve(deq,y(x),hint='2nd_power_series_ordinary',ics={y(0):1,diff(y(x
),x).subs(x,0):0})
print(ysoln.expand())
print('NOTE that Python did not solve for the coefficients.  In general, th
e constant is a0 = y(0)')
print("and the coefficient of 'x' is a1=y'(0)")
```

```
Eq(y(x), C2 + C2*x**2/2 + C2*x**4/24 + C1*x + C1*x**3/6 + O(x**6))
NOTE that Python did not solve for the coefficients.  In general, the const
ant is a0 = y(0)
and the coefficient of 'x' is a1=y'(0)
```

Example 2: y'' + xy' + 3y = 0; y(0)=1; y'(0)=2

In [12]:
```
x=symbols('x')
y=Function('y')
deq=diff(y(x),x,2)+x*diff(y(x),x)+3*y(x)
ysoln=dsolve(deq,y(x),hint='2nd_power_series_ordinary')
print('The series solution is',ysoln.expand())
print("Again, C2 = a0 = y(0) and C1 = a1 = y'(0)")
```

```
The series solution is Eq(y(x), C2 - 3*C2*x**2/2 + 5*C2*x**4/8 + C1*x - 2*C
1*x**3/3 + O(x**6))
Again, C2 = a0 = y(0) and C1 = a1 = y'(0)
```

Example 3: (x^2 + 1)y'' + 10xy' + 8y = 0, y(0)=1, y'(0)=0

In [13]:
```
x=symbols('x')
y=Function('y')
# use dsolve with hint "2nd_power_series_ordinary"
deq=(x**2+1)*diff(y(x),x,2)+10*x*diff(y(x),x)+8*y(x)
ysoln=dsolve(deq,y(x),hint='2nd_power_series_ordinary')
print('The solution is',ysoln.expand())
print("Again, C1 = a1 = y'(0) and C2 = a0 = y(0)")
```

```
The solution is Eq(y(x), C2 - 4*C2*x**2 + 10*C2*x**4 + C1*x - 3*C1*x**3 + O
(x**6))
Again, C1 = a1 = y'(0) and C2 = a0 = y(0)
```

In [ ]: