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

Example 1: Solve the ODE y'' + 3y' + 2y = 0.

In [2]:
```
#Using the technique discussed in class:
t=symbols('t')
y=Function('y')
dsolve(diff(y(t),t,2)+3*diff(y(t),t)+2*y(t),y(t)) #Note that expanding it gives the same solution as in class
```

Out[2]: $y(t) = \left(C_1 + C_2e^{-t}\right)e^{-t}$

Example 2: Solve the IVP y'' + y' - 6y = 0, y(0)=1, y'(0)= 2

In [3]:
```
# Using dsolve and ics option
t=symbols('t')
y=Function('y')
ysoln=dsolve(diff(y(t),t,2)+diff(y(t),t)-6*y(t),y(t),ics={y(0):1,diff(y(t),t).subs(t,0):2})
# NOTICE how y'(0) has to be entered.  y is a FUNCTION, but diff(y(t),t) is an expression which requires substitution
print(ysoln)
```

```
Eq(y(t), exp(2*t))
```

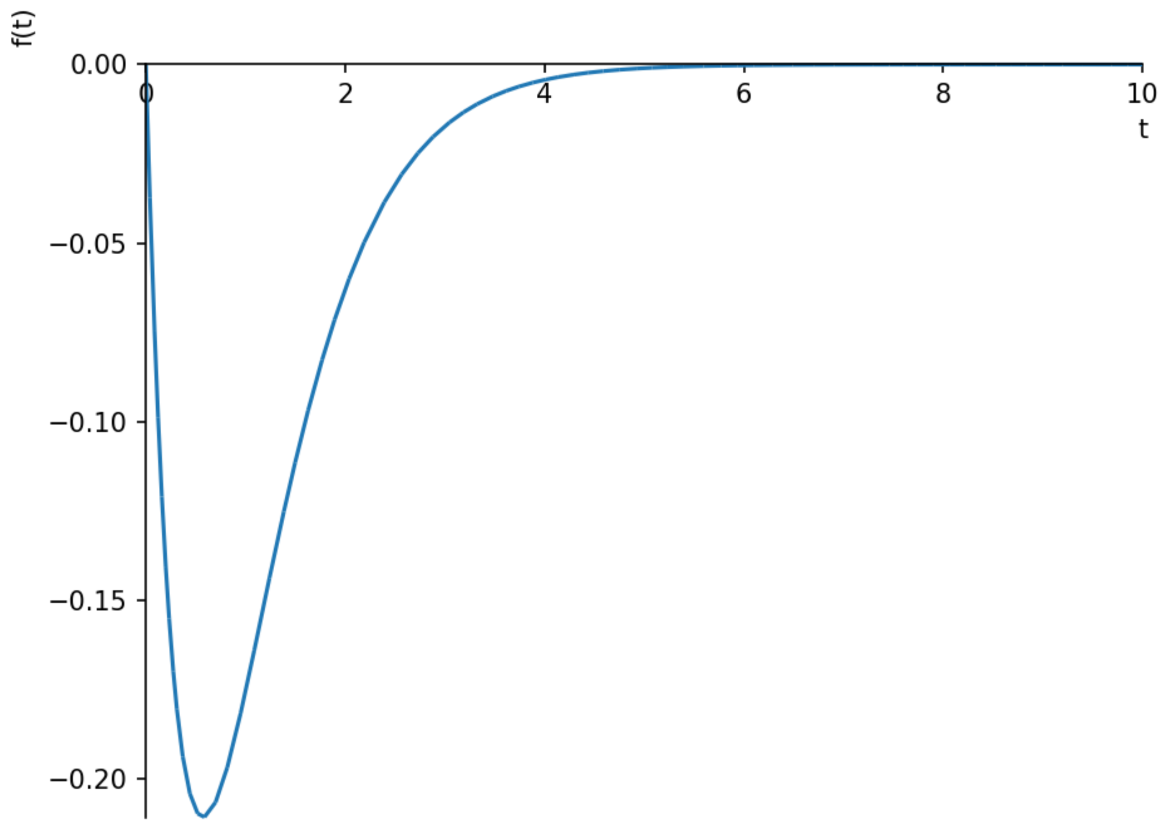
Example 3: Solve the IVP 2y''+7y'+6y = 0, y(0) = 0, y'(0) = -1

In [5]:
```
t=symbols('t')
y=Function('y')
ysoln=dsolve(2*diff(y(t),t,2)+7*diff(y(t),t)+6*y(t),y(t),ics={y(0):0,diff(y(t),t).subs(t,0):-1})
print('The solution to the IVP is',ysoln)
# NOTE that by properties of exponents, e^t^(3/2) = e^(3/2t)
```

```
Eq(y(t), 2*exp(-2*t) - 2/exp(t)**(3/2))
```

In [7]:
```
matplotlib notebook
```

In [9]:
```
yoft=ysoln.rhs
plot(yoft,(t,0,10))
print('Note y-->0 as t-->oo which makes sense since both roots are negativ
e.')
```




```
Note y-->0 as t-->oo which makes sense since both roots are negative.
```

In [ ]: