In [2]:
```
from sympy import *
```

Example 1: The Laplace Transform of f(t) = 1

In [5]:
```
s,t=symbols('s t',positive=True)
f=1
F1=integrate(f*exp(-s*t),(t,0,oo))
print('The Laplace Transform is',F1)
# OR compute directly using laplace_transform(f,t,s)[0]  (function, old var, new var)
print(laplace_transform(f,t,s)[0])
print('NOTE: the [0] is there because the laplace transform returns a "tuple" of arguments, the fi
rst being the actual transform.')
```

```
The Laplace Transform is 1/s
1/s
NOTE: the [0] is there because the laplace transform returns a "tuple" of arguments, the first bein
g the actual transform.
```

Example 2: The Laplace Transform of e^(at)

In [6]:
```
a=symbols('a',positive=True)
f=exp(a*t)
F2=integrate(f*exp(-s*t),(t,0,oo))
print('The Laplace Transform is',F2)
# The first piece is the correct one; Python does not assume a<s, as shown by the direct computati
on
print(laplace_transform(f,t,s)[0])
```

```
The Laplace Transform is Piecewise((-1/(a*(1 - s/a)), And(-a + s > 0, s/a != 1)), (Integral(exp(a*
t)*exp(-s*t), (t, 0, oo)), True))
1/(-a + s)
```

Example 3: f(t) = e^(at) if 0<=t<=1/a; 0 otherwise. Notice the answer above gives us a clue how to enter a Piecewise-defined function.

In [7]:
```
a=symbols('a',positive=True)
f=Piecewise((exp(a*t),t<=1/a),(0,True))
# Computing directly from now on
print('The Laplace Transform is',laplace_transform(f,t,s)[0])
```

```
The Laplace Transform is Piecewise((1/a, a == s), ((exp(s/a) - E)*exp(-s/a)/(-a + s), True))
```

Example 4: The Laplace Transform of f(t)=cos(a * t)

In [8]:
```
a=symbols('a',positive=True)
f=cos(a*t)
print('The Laplace transform is',laplace_transform(f,t,s)[0])
```

```
The Laplace transform is s/(a**2 + s**2)
```

Example 5: Using the answers above, find the Laplace Transform of f(t)=4e^(3t) - 5cos(2t)

In [12]:
```
t=symbols('t')
f=4*exp(3*t)-5*cos(2*t)
print('The Laplace transform is',laplace_transform(f,t,s)[0].simplify())
```

```
The Laplace transform is -5*s/(4*(s**2/4 + 1)) + 4/(3*(s/3 - 1))
```

In [ ]:
```

```