LAB 6: Computing Laplace transform and inverse Laplace transform of standard functions

Program 1: Program to find Laplace transform of a(constant) and e^{at} using in-built function laplace_transform( ).

```
from sympy import *
t, s = symbols('t, s')
a = symbols ('a', real =True , positive = True )

f1=a
print ('the Laplace transform of ',f1 ,'is ')
display ( laplace_transform (f1 , t, s, noconds = True ))

f2=exp (a*t)
print ('the Laplace transform of ',f2 ,'is ')
display ( laplace_transform (f2 , t, s, noconds = True))
```

Output:

```
the Laplace transform of  a is
```

$$\frac{a}{s}$$

```
the Laplace transform of  exp(a*t) is
```

$$\frac{1}{-a+s}$$

Program 2: Program to find inverse Laplace transform of $\frac{a}{s}$ and $\frac{1}{s-a}$ using in-built function inverse_laplace_transform( ).

```
from sympy import *
s= symbols ('s')
t = Symbol ('t', positive = True )
a = symbols ('a', real = True )
# Using inverse_laplace_transform () method
F1 = a/s
print ("Inverse Laplace Transform of", F1 ,"is")
display(inverse_laplace_transform (F1, s, t))

F2 = 1/(s-a)
print ("Inverse Laplace Transform of", F2 ,"is")
display(inverse_laplace_transform (F2, s, t))
```

Output:

```
Inverse Laplace Transform of a/s is
```

$$a$$

```
Inverse Laplace Transform of 1/(-a + s) is
```

$$e^{at}$$

Exercise: Write python program for the following

1. Find Laplace transform of $\cos(at), \sin(at), \cosh(at), \sinh(at)$ and t^4.
2. Find inverse Laplace transform of $\frac{s}{s^2+a^2}, \frac{1}{s^2+a^2}, \frac{s}{s^2-a^2}, \frac{1}{s^2-a^2}$ and $\frac{1}{s^4}$.
3. Find Laplace transform of $t\cos(4t)$ and $\frac{\sin(2t)}{t}$.
4. Find inverse Laplace transform of $\frac{s^2+s-2}{s(s-2)(s+3)}$ and $\frac{s}{s^4+4a^4}$.