In [ ]:

```

```

This is the *first exercise* : calculate $\sum n = 1^{10}n^2$.

In [1]:

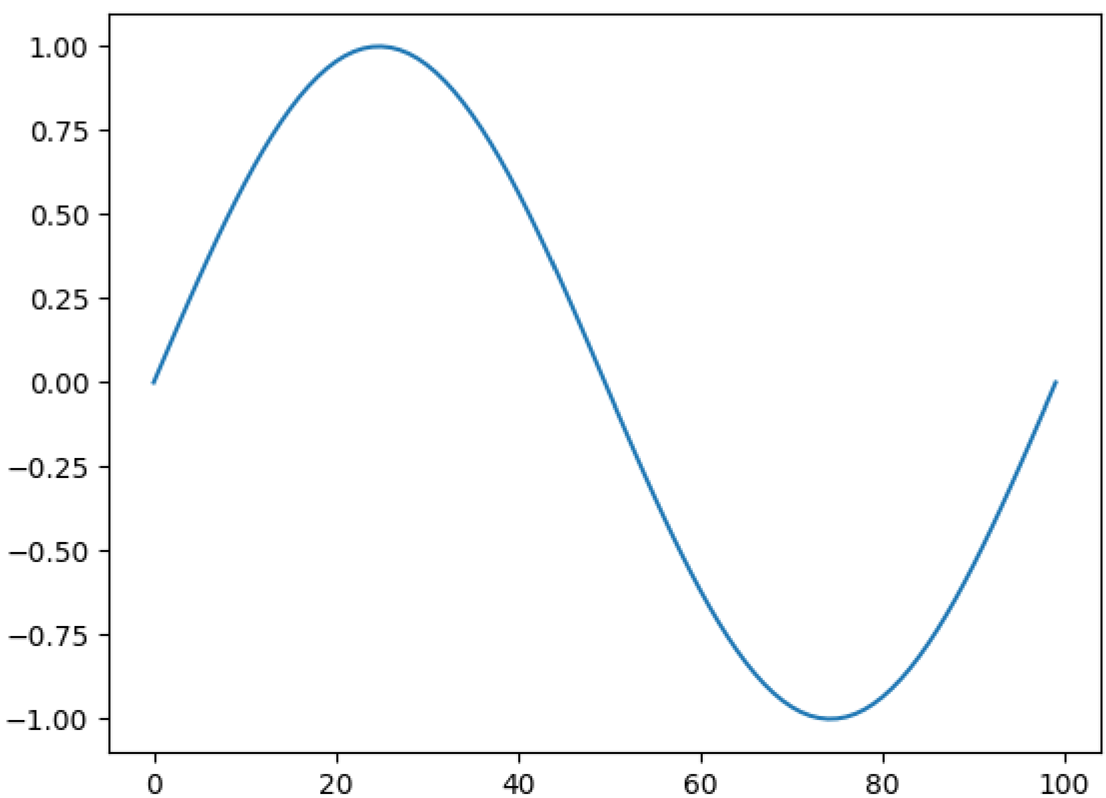
```
s = 0
for n in range (1,11) :
    print(n)
    s = s + n **2
print(s)
```

```
1
2
3
4
5
6
7
8
9
10
385
```

In [2]:

```
%matplotlib inline
import matplotlib.pyplot as mp
import numpy as np
x = np.linspace(0., 2.*np.pi, 100)
mp.plot(np.sin(x))
```

Out[2]: `[<matplotlib.lines.Line2D at 0x1e301311b50>]`



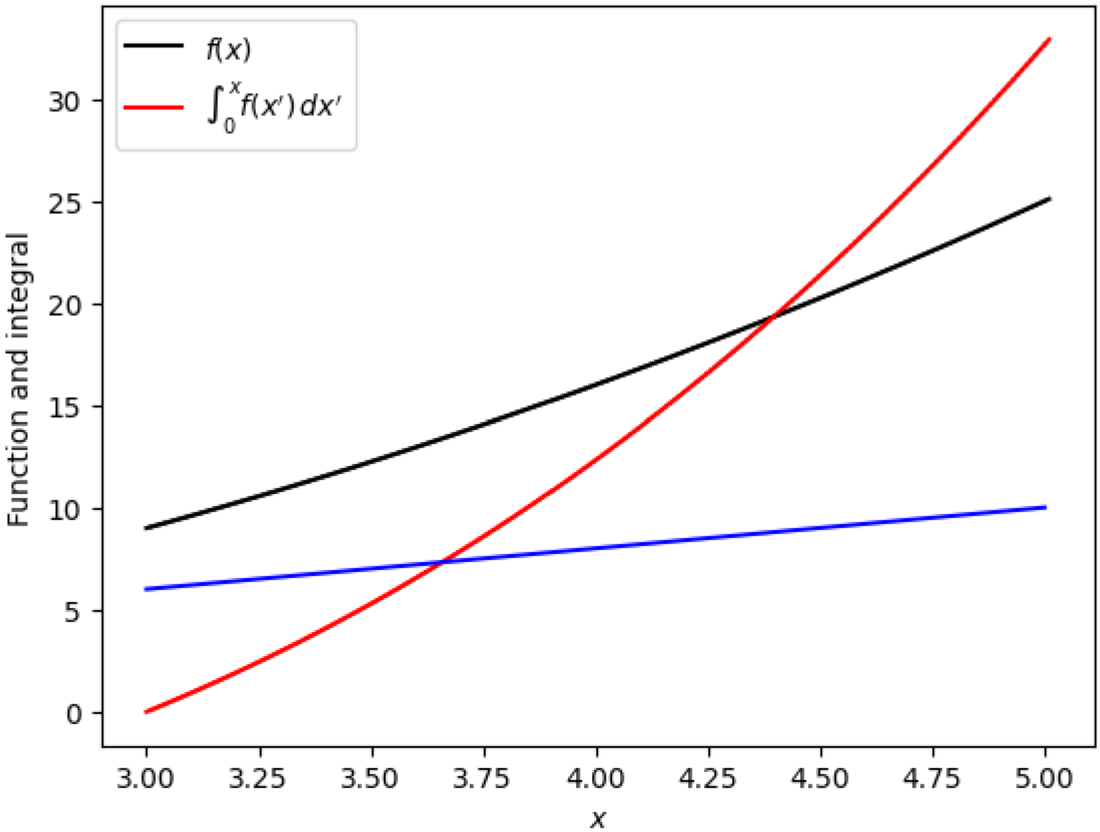
In [1]:

```python
from math import *
import matplotlib.pyplot as plot
fctn = input("Enter a function of x: ")
a = float(input("Enter starting value of x: "))
b = float(input("Enter ending value of x: "))
N = int( input("Enter number of samples: "))
def f(x):
    return eval(fctn) #returns the function
I = 0.0
x = a
dx = (b-a)/(N-1)
y = f(a)
# d = 0.0
h = dx
# fn = y + h
ax = []
bx = []

plot.plot(x, y, 'k-', label=r"$f(x)$")
plot.plot(x, I, 'r-', label=r"$\int_0^x f(x')\,dx'$")

print("Step #    x    Int")
z = 0
while x < b:
    xn = x + dx
    yn = f(xn)
    In = I + 0.5*(y+yn)*dx # trapezoidal rule
    plot.plot([x, xn], [y, yn], 'k-')
    plot.plot([x, xn], [I, In], 'r-')
    derivative = (yn - y) / dx
    ax.append(x)
    bx.append(derivative)
    x = xn
    y = yn
    I = In
    if (z % 20 == 0):
        print(z," ",x, "    ", I)
    z+=1
plot.plot(ax,bx, 'b-')
plot.xlabel(r'$x$')
plot.ylabel('Function and integral')
plot.legend()
plot.show()
print("final value of integral = ", I)
# "x**2" -> x^2
# An example of a simple Python program (cont’d)
```

```
Step #   x   Int
0   3.0100502512562812     0.09075579153310553
20   3.211055276381906     2.0362678014704185
40   3.4120603015075304     4.241252473320864
60   3.613065326633155     6.721952227235497
80   3.8140703517587795     9.494609483365377
100   4.015075376884404     12.575466661861554
120   4.216080402010029     15.980766182875088
140   4.417085427135653     19.726750466557043
160   4.618090452261278     23.829661933058464
180   4.819095477386902     28.30574300253042
```




```
final value of integral =  32.91846216258405
```