

202001555 지은미

```
In [17]: from IPython.core.interactiveshell import InteractiveShell
InteractiveShell.ast_node_interactivity="all"
```

```
In [18]: L=list(range(10))

L2=[str(c) for c in L]
L2

type(L2[0])

L3=[True, "2", 3.0, 4]

[type(item) for item in L3]
```

```
Out[18]: ['0', '1', '2', '3', '4', '5', '6', '7', '8', '9']
```

```
Out[18]: str
```

```
Out[18]: [bool, str, float, int]
```

```
In [19]: import array
L=list(range(10))
A=array.array('i',L)
A
```

```
Out[19]: array('i', [0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

```
In [20]: import numpy as np

np.array([1,4,2,5,3])

np.array([3.14,4,2,3])

np.array([1,2,3,4],dtype='float32')

np.array([range(i,i+3) for i in [2,4,6]])
```

```
Out[20]: array([1, 4, 2, 5, 3])
```

```
Out[20]: array([3.14, 4. , 2. , 3. ])
```

```
Out[20]: array([1., 2., 3., 4.], dtype=float32)
```

```
Out[20]: array([[2, 3, 4],
               [4, 5, 6],
               [6, 7, 8]])
```

```
In [21]: np.zeros(10,dtype=int)

np.ones((3,5),dtype=float)

np.full((3,5),3.14)

np.arange(0,20,2)

np.linspace(0,1,5)

np.random.random((3,3))

np.random.normal(0,1,(3,3))
```

```
np.random.randint(0,10,(3,3))

np.eye(3)

np.empty(3)
```

```
Out[21]: array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0])

Out[21]: array([[1., 1., 1., 1., 1.],
                [1., 1., 1., 1., 1.],
                [1., 1., 1., 1., 1.]])

Out[21]: array([[3.14, 3.14, 3.14, 3.14, 3.14],
                [3.14, 3.14, 3.14, 3.14, 3.14],
                [3.14, 3.14, 3.14, 3.14, 3.14]])

Out[21]: array([ 0,  2,  4,  6,  8, 10, 12, 14, 16, 18])

Out[21]: array([0. , 0.25, 0.5 , 0.75, 1.  ])

Out[21]: array([[0.65279032, 0.63505887, 0.99529957],
                [0.58185033, 0.41436859, 0.4746975 ],
                [0.6235101 , 0.33800761, 0.67475232]])

Out[21]: array([[ 1.0657892 , -0.69993739,  0.14407911],
                [ 0.3985421 ,  0.02686925,  1.05583713],
                [-0.07318342, -0.66572066, -0.04411241]])

Out[21]: array([[7, 2, 9],
                [2, 3, 3],
                [2, 3, 4]])

Out[21]: array([[1., 0., 0.],
                [0., 1., 0.],
                [0., 0., 1.]])

Out[21]: array([1., 1., 1.])
```

```
In [22]: import numpy as np
         np.random.seed(0)

         x1=np.random.randint(10, size=6)
         x2=np.random.randint(10, size=(3,4))
         x3=np.random.randint(10,size=(3,4,5))

         print("x3 ndim: ", x3.ndim)
         print("x3 shape: ",x3.shape)
         print("x3 size: ", x3.size)

         print("dtype: ",x3.dtype)

         print("itemsize: ", x3.itemsize,"bytes")
         print("nbytes: ",x3.nbytes,"bytes")
```

```
x3 ndim:  3
x3 shape: (3, 4, 5)
x3 size:  60
dtype:  int32
itemsize: 4 bytes
nbytes:  240 bytes
```

```
In [23]: x1

         x1[0]

         x1[4]

         x1[-1]

         x1[-2]
```

```
x2  
  
x2[0,0]  
  
x2[2,0]  
  
x2[2,-1]  
  
x2[0,0]=12  
  
x2  
  
x1[0]=3.14159  
  
x1
```

Out[23]: array([5, 0, 3, 3, 7, 9])

Out[23]: 5

Out[23]: 7

Out[23]: 9

Out[23]: 7

Out[23]: array([[3, 5, 2, 4],
 [7, 6, 8, 8],
 [1, 6, 7, 7]])

Out[23]: 3

Out[23]: 1

Out[23]: 7

Out[23]: array([[12, 5, 2, 4],
 [7, 6, 8, 8],
 [1, 6, 7, 7]])

Out[23]: array([3, 0, 3, 3, 7, 9])

```
In [24]: x=np.arange(10)  
x  
  
x[:5]  
  
x[5:]  
  
x[4:7]  
  
x[::2]  
  
x[1::2]  
  
x[::-1]  
  
x[5::-2]
```

Out[24]: array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])

Out[24]: array([0, 1, 2, 3, 4])

Out[24]: array([5, 6, 7, 8, 9])

Out[24]: array([4, 5, 6])

Out[24]: array([0, 2, 4, 6, 8])

```
Out[24]: array([1, 3, 5, 7, 9])
```

```
Out[24]: array([9, 8, 7, 6, 5, 4, 3, 2, 1, 0])
```

```
Out[24]: array([5, 3, 1])
```

```
In [25]: print(x2)

x2[:2,:3]

x2[:3,::2]

x2[:, :-1, ::-1]

print(x2[:,0])

print(x2[0,:])

print(x2[0])

print(x2)

x2_sub = x2[:2,:2]
print(x2_sub)

x2_sub[0,0] = 99
print(x2_sub)

print(x2)
```

```
[[12  5  2  4]
 [ 7  6  8  8]
 [ 1  6  7  7]]
```

```
Out[25]: array([[12,  5,  2],
               [ 7,  6,  8]])
```

```
Out[25]: array([[12,  2],
               [ 7,  8],
               [ 1,  7]])
```

```
Out[25]: array([[ 7,  7,  6,  1],
               [ 8,  8,  6,  7],
               [ 4,  2,  5, 12]])
```

```
[12  7  1]
[12  5  2  4]
[12  5  2  4]
[[12  5  2  4]
 [ 7  6  8  8]
 [ 1  6  7  7]]
[[12  5]
 [ 7  6]]
[[99  5]
 [ 7  6]]
[[99  5  2  4]
 [ 7  6  8  8]
 [ 1  6  7  7]]
```

```
In [26]: grid=np.arange(1,10).reshape((3,3))
print(grid)

x=np.array([1,2,3])

x.reshape((1,3))

x[np.newaxis,: ]

x.reshape((3,1))
```

```
x[:,np.newaxis]
```

```
[[1 2 3]
 [4 5 6]
 [7 8 9]]
```

```
Out[26]: array([[1, 2, 3]])
```

```
Out[26]: array([[1, 2, 3]])
```

```
Out[26]: array([[1],
                [2],
                [3]])
```

```
Out[26]: array([[1],
                [2],
                [3]])
```

```
In [27]: x=np.array([1,2,3])
         y=np.array([3,2,1])
         np.concatenate([x,y])

         z=[99,99,99]
         print(np.concatenate([x,y,z]))

         grid=np.array([[1,2,3],[4,5,6]])

         np.concatenate([grid,grid],axis=1)

         x=np.array([1,2,3])
         grid=np.array([[9,8,7],[6,5,4]])

         np.vstack([x,grid])

         y=np.array([[99],[99]])
         np.hstack([grid,y])
```

```
Out[27]: array([1, 2, 3, 3, 2, 1])
         [ 1  2  3  3  2  1 99 99 99]
```

```
Out[27]: array([[1, 2, 3, 1, 2, 3],
                [4, 5, 6, 4, 5, 6]])
```

```
Out[27]: array([[1, 2, 3],
                [9, 8, 7],
                [6, 5, 4]])
```

```
Out[27]: array([[ 9,  8,  7, 99],
                [ 6,  5,  4, 99]])
```

```
In [28]: x=[1,2,3,99,99,3,2,1]
         x1, x2, x3=np.split(x,[3,5])
         print(x1,x2,x3)

         grid=np.arange(16).reshape((4,4))
         grid

         upper, lower=np.vsplit(grid,[2])
         print(upper)
         print(lower)

         left, right=np.hsplit(grid,[2])
         print(left)
         print(right)
```

```
[1 2 3] [99 99] [3 2 1]
```

```
Out[28]: array([[ 0,  1,  2,  3],
                [ 4,  5,  6,  7],
```

```

    [ 8,  9, 10, 11],
    [12, 13, 14, 15]])
[[0 1 2 3]
 [4 5 6 7]]
[[ 8  9 10 11]
 [12 13 14 15]]
[[ 0  1]
 [ 4  5]
 [ 8  9]
 [12 13]]
[[ 2  3]
 [ 6  7]
 [10 11]
 [14 15]]

```

```

In [1]: import numpy as np
import matplotlib.pyplot as plt
import math

```

```

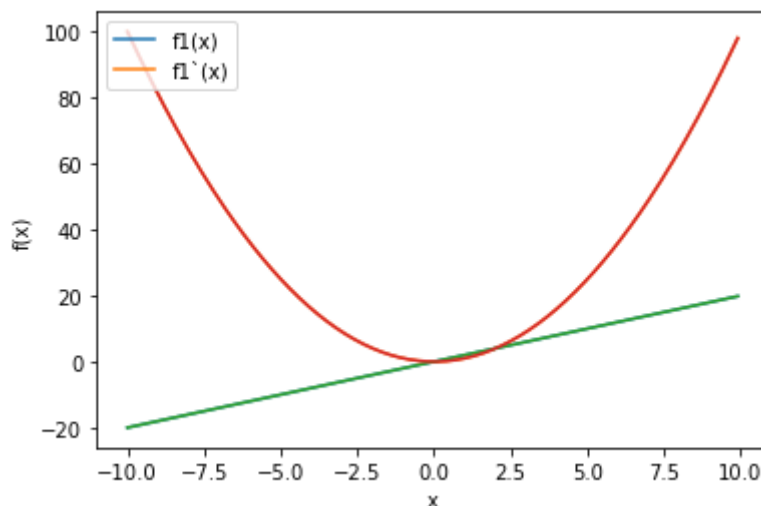
In [2]: def diff(f,x):
        h=1e-10
        return (f(x+h)-f(x))/h

def f1(x):
    return x**2

x = np.arange(-10.0,10.0,0.1)
y1 = diff(f1,x)
y2 = f1(x)
plt.xlabel("x")
plt.ylabel("f(x)")
plt.plot(x,y1,label='f1(x)')
plt.plot(x,y2,label='f1\`'(x)')
plt.legend(loc=2)
plt.plot(x,y1)
plt.plot(x,y2)
plt.show()

print("f1'(2)=",diff(f1,2))

```



f1'(2)= 4.000000330961484

```

In [3]: import numpy as np
import matplotlib.pyplot as plt
import math

def diff(f,x):
    h=1e-10
    return (f(x+h)-f(x))/h

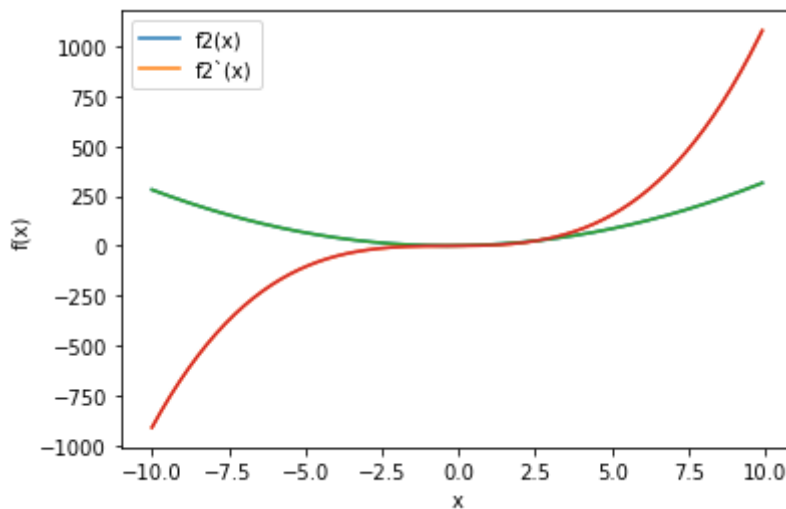
```

```
def f2(x):
    return x**3+x**2+x

x = np.arange(-10.0,10.0,0.1)
y1 = diff(f2,x)
y2 = f2(x)
plt.xlabel("x")
plt.ylabel("f(x)")
plt.plot(x,y1,label='f2(x)')
plt.plot(x,y2,label='f2'(x)')
plt.legend(loc=2)

plt.plot(x,y1)
plt.plot(x,y2)
plt.show()

print("f2'(2)=",diff(f2,2))
```



f2'(2)= 17.000001406586307

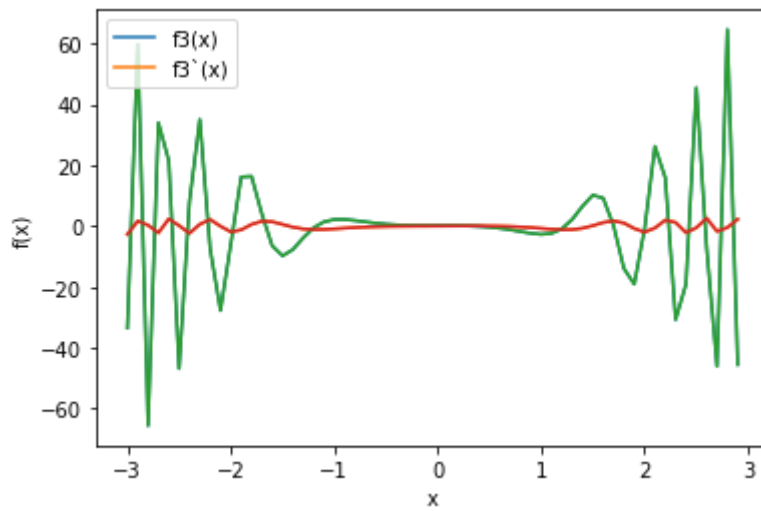
```
In [4]: import numpy as np
import matplotlib.pyplot as plt
import math

def diff(f,x):
    h=1e-10
    return (f(x+h)-f(x))/h

def f3(x):
    return x*np.sin(x*x*x+3)

x = np.arange(-3.0,3.0,0.1)
y1= diff(f3,x)
y2= f3(x)
plt.xlabel("x")
plt.ylabel("f(x)")
plt.plot(x,y1,label='f3(x)')
plt.plot(x,y2,label='f3'(x)')
plt.legend(loc=2)
plt.plot(x,y1)
plt.plot(x,y2)
plt.show()

print("f3'(2)=",diff(f3,2))
```



$f_3'(2) = -0.893773943744236$

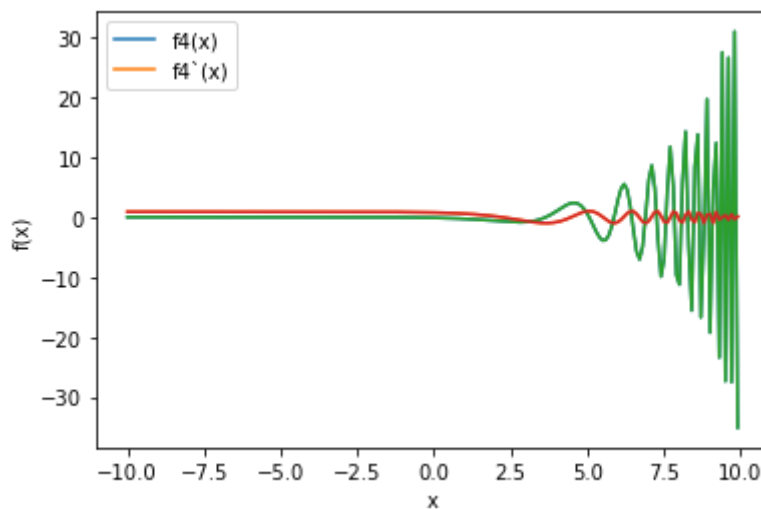
```
In [5]: import numpy as np
import matplotlib.pyplot as plt
import math

def diff(f,x):
    h=1e-10
    return (f(x+h)-f(x))/h

def f4(x):
    return np.cos(np.sqrt(np.exp(x)+1)/2)

x = np.arange(-10.0,10.0,0.1)
y1= diff(f4,x)
y2=f4(x)
plt.xlabel("x")
plt.ylabel("f(x)")
plt.plot(x,y1,label='f4(x)')
plt.plot(x,y2,label='f4'(x)')
plt.legend(loc=2)
plt.plot(x,y1)
plt.plot(x,y2)
plt.show()

print("f4'(2)=",diff(f4,2))
```



$f_4'(2) = -0.6329958779360823$

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