derivative

November 10, 2022

0.1 Derivatives

5 point

$$f'(x) \approx \frac{-f(x+2h) + 8f(x+h) - 8f(x-h) + f(x-2h)}{12h}$$

or in other word:

$$f'(x) \approx \frac{-f_{+2} + 8f_{+1} - 8f_{-1} + f_{-2}}{12h}$$

[4]:
```
import numpy as np

x=np.linspace(-5,5, 100)

f1=np.sin(x)

#f2=x**2+4*x


def deriv5p(y,x):
    """
    y:array
    array of function

    x:array
    range of x values
    """
    #  we have four terms based on definition then ..

    t2p = -y[4:]
    t1p = +8*y[3:-1]
    tz  = y[2:-2]
    t1m = -8*y[1:-3]
    t2m = +y[:-4]

    h=x[1]-x[0]
```

```
    result = (t2p+t1p+t1m+t2m)/(12*h)

    return result
```

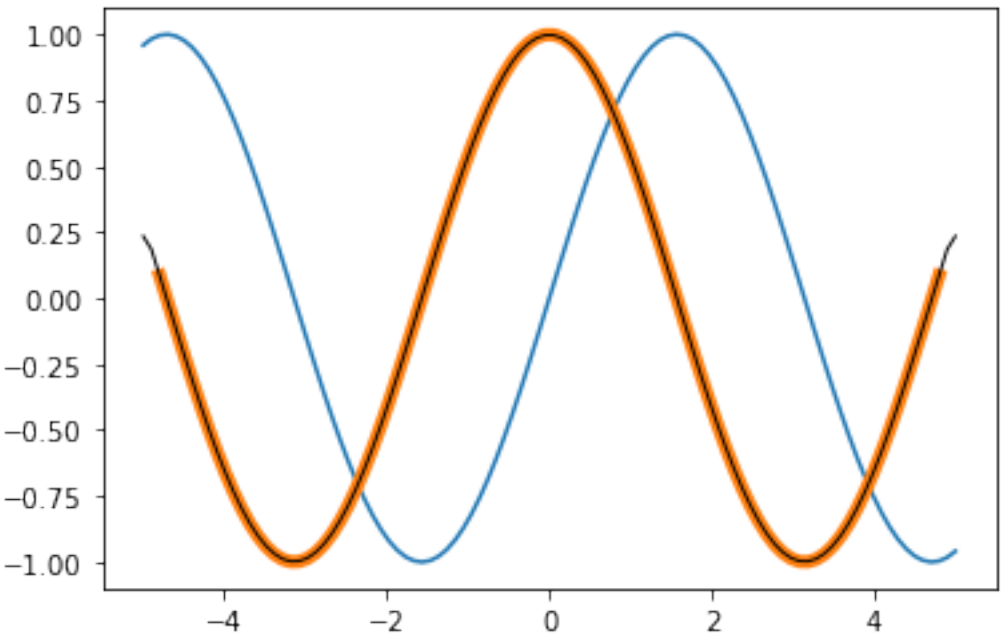
[5]:
```
rs = deriv5p(f1,x)
```

[13]:
```
import matplotlib.pyplot as plt
dist = x[1]-x[0]

#  This is gradient by numpy lib
test = np.gradient(f1, dist)

plt.plot(x, f1)
plt.plot(x[2:-2], rs, lw=5, label='my function')
plt.plot(x,test, lw=1, label='numpy result', c='black')
```

[13]:
```
[<matplotlib.lines.Line2D at 0x7f241754dab0>]
```



[ ]:
```
```