

```
In [2]: import numpy as np
```

```
In [3]: lst = [1,2,3,4,5]
print(lst)
```

```
[1, 2, 3, 4, 5]
```

```
In [4]: print("1D Array")
a = np.array([1,2,3,4,5])
print(a)
```

```
1D Array
[1 2 3 4 5]
```

```
In [5]: print("2D Array")
b = np.array([[1,2,3,4,5],
              [6,7,8,9,10]])
print(b)
```

```
2D Array
[[ 1  2  3  4  5]
 [ 6  7  8  9 10]]
```

```
In [6]: print("3D Array")
c = np.array([[1,2,3],
              [4,5,6],
              [7,8,9]])
print(c)
```

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

```
In [7]: type(a)
```

```
Out[7]: numpy.ndarray
```

```
In [8]: print(a.size)
print(b.size)
print(c.size)
```

```
5
10
9
```

```
In [9]: print(a.shape)
print(b.shape)
print(c.shape)
```

```
(5,)
(2, 5)
(3, 3)
```

```
In [10]: print(a.dtype)
print(b.dtype)
print(c.dtype)
```

```
int32
int32
int32
```

```
In [11]: d = np.array([[1,2,3.5],
                      [4,5.6,7],
                      [4,2,3.56]])
print(d.dtype)

float64
```

```
In [12]: d.transpose()
```

```
Out[12]: array([[1. , 4. , 4. ],
               [2. , 5.6 , 2. ],
               [3.5 , 7. , 3.56]])
```

```
In [13]: np.empty((4,4), dtype = float)
```

```
Out[13]: array([[4.67296746e-307, 1.69121096e-306, 1.60218491e-306,
                8.34441742e-308],
               [1.78022342e-306, 6.23058028e-307, 9.79107872e-307,
                6.89807188e-307],
               [7.56594375e-307, 6.23060065e-307, 1.78021527e-306,
                8.34454050e-308],
               [1.11261027e-306, 1.15706896e-306, 1.33512173e-306,
                1.33504432e-306]])
```

```
In [14]: x = np.ones(6)
x
```

```
Out[14]: array([1., 1., 1., 1., 1., 1.])
```

```
In [15]: x = np.ones((3,5))
x
```

```
Out[15]: array([[1., 1., 1., 1., 1.],
               [1., 1., 1., 1., 1.],
               [1., 1., 1., 1., 1.]])
```

```
In [16]: x = np.ones((3,5), dtype = int)
x
```

```
Out[16]: array([[1, 1, 1, 1, 1],
               [1, 1, 1, 1, 1],
               [1, 1, 1, 1, 1]])
```

```
In [17]: x = np.zeros(4)
x
```

```
Out[17]: array([0., 0., 0., 0.])
```

```
In [18]: x = np.ones((3,5), dtype = str)
x
```

```
Out[18]: array([[ '1', '1', '1', '1', '1'],
               [ '1', '1', '1', '1', '1'],
               [ '1', '1', '1', '1', '1']], dtype='<U1')
```

```
In [19]: x = np.ones((3,5), dtype = bool)
x
```

```
Out[19]: array([[ True,  True,  True,  True,  True],
               [ True,  True,  True,  True,  True],
               [ True,  True,  True,  True,  True]])
```

```
In [20]: x = np.zeros((3,5), dtype = bool)
x
```

```
Out[20]: array([[False, False, False, False, False],
               [False, False, False, False, False],
               [False, False, False, False, False]])
```

```
In [21]: a = np.arange(1,20)
         print(a)

[ 1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19]
```

```
In [22]: a = np.arange(1,20,2)
         print(a)

[ 1  3  5  7  9 11 13 15 17 19]
```

```
In [24]: a = np.arange(2,20,2)
         print(a)

[ 2  4  6  8 10 12 14 16 18]
```

```
In [26]: a = a.reshape((3,3))
         print(a)

[[ 2  4  6]
 [ 8 10 12]
 [14 16 18]]
```

```
In [28]: b = np.arange(1,100,2)
         print(b)

[ 1  3  5  7  9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47
 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95
 97 99]
```

```
In [29]: b = b.reshape((10,5))
         print(b)

[[ 1  3  5  7  9]
 [11 13 15 17 19]
 [21 23 25 27 29]
 [31 33 35 37 39]
 [41 43 45 47 49]
 [51 53 55 57 59]
 [61 63 65 67 69]
 [71 73 75 77 79]
 [81 83 85 87 89]
 [91 93 95 97 99]]
```

```
In [30]: b = b.flatten()
         b
```

```
Out[30]: array([ 1,  3,  5,  7,  9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33,
                35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67,
                69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99])
```

```
In [31]: a = a.ravel()
         a
```

```
Out[31]: array([ 2,  4,  6,  8, 10, 12, 14, 16, 18])
```

```
In [32]: a = np.arange(1,51)
         a = a.reshape(10,5)
         a
```

```
Out[32]: array([[ 1,  2,  3,  4,  5],
               [ 6,  7,  8,  9, 10],
               [11, 12, 13, 14, 15],
               [16, 17, 18, 19, 20],
               [21, 22, 23, 24, 25],
               [26, 27, 28, 29, 30],
               [31, 32, 33, 34, 35],
               [36, 37, 38, 39, 40],
               [41, 42, 43, 44, 45],
               [46, 47, 48, 49, 50]])
```

```
In [33]: a[0]
```

```
Out[33]: array([1, 2, 3, 4, 5])
```

```
In [34]: a[2]
```

```
Out[34]: array([11, 12, 13, 14, 15])
```

```
In [35]: a[0,0]
```

```
Out[35]: 1
```

```
In [36]: a[3,4]
```

```
Out[36]: 20
```

```
In [37]: a[2:5]
```

```
Out[37]: array([[11, 12, 13, 14, 15],
               [16, 17, 18, 19, 20],
               [21, 22, 23, 24, 25]])
```

```
In [38]: a[0:10]
```

```
Out[38]: array([[ 1,  2,  3,  4,  5],
               [ 6,  7,  8,  9, 10],
               [11, 12, 13, 14, 15],
               [16, 17, 18, 19, 20],
               [21, 22, 23, 24, 25],
               [26, 27, 28, 29, 30],
               [31, 32, 33, 34, 35],
               [36, 37, 38, 39, 40],
               [41, 42, 43, 44, 45],
               [46, 47, 48, 49, 50]])
```

```
In [39]: a[:, 2]
```

```
Out[39]: array([ 3,  8, 13, 18, 23, 28, 33, 38, 43, 48])
```

```
In [40]: a[2:5, 4]
```

```
Out[40]: array([15, 20, 25])
```

```
In [42]: a[:, 2:5]
```

```
Out[42]: array([[ 3,  4,  5],
               [ 8,  9, 10],
               [13, 14, 15],
               [18, 19, 20],
               [23, 24, 25],
               [28, 29, 30],
               [33, 34, 35],
               [38, 39, 40],
               [43, 44, 45],
               [48, 49, 50]])
```

```
In [43]: a[:, 2:5].dtype
```

```
Out[43]: dtype('int32')
```

```
In [44]: a = np.arange(0,18).reshape((6,3))
         b = np.arange(20,38).reshape((3,6))
         print(a)
         print(b)
```

```
[[ 0  1  2]
 [ 3  4  5]
 [ 6  7  8]
 [ 9 10 11]
 [12 13 14]
 [15 16 17]]
[[20 21 22]
 [23 24 25]
 [26 27 28]
 [29 30 31]
 [32 33 34]
 [35 36 37]]
```

```
In [45]: a+b
```

```
Out[45]: array([[20, 22, 24],
               [26, 28, 30],
               [32, 34, 36],
               [38, 40, 42],
               [44, 46, 48],
               [50, 52, 54]])
```

```
In [46]: np.add(a,b)
```

```
Out[46]: array([[20, 22, 24],
               [26, 28, 30],
               [32, 34, 36],
               [38, 40, 42],
               [44, 46, 48],
               [50, 52, 54]])
```

```
In [47]: a-b
```

```
Out[47]: array([[-20, -20, -20],
               [-20, -20, -20],
               [-20, -20, -20],
               [-20, -20, -20],
               [-20, -20, -20],
               [-20, -20, -20]])
```

```
In [49]: np.subtract(a,b)
```

```
Out[49]: array([[ -20,  -20,  -20],
               [ -20,  -20,  -20],
               [ -20,  -20,  -20],
               [ -20,  -20,  -20],
               [ -20,  -20,  -20],
               [ -20,  -20,  -20]])
```

```
In [50]: a*b
```

```
Out[50]: array([[  0,  21,  44],
               [ 69,  96, 125],
               [156, 189, 224],
               [261, 300, 341],
               [384, 429, 476],
               [525, 576, 629]])
```

```
In [51]: np.multiply(a,b)
```

```
Out[51]: array([[  0,  21,  44],
               [ 69,  96, 125],
               [156, 189, 224],
               [261, 300, 341],
               [384, 429, 476],
               [525, 576, 629]])
```

```
In [52]: a/b
```

```
Out[52]: array([[0.          , 0.04761905, 0.09090909],
               [0.13043478, 0.16666667, 0.2          ],
               [0.23076923, 0.25925926, 0.28571429],
               [0.31034483, 0.33333333, 0.35483871],
               [0.375       , 0.39393939, 0.41176471],
               [0.42857143, 0.44444444, 0.45945946]])
```

```
In [53]: np.divide(a,b)
```

```
Out[53]: array([[0.          , 0.04761905, 0.09090909],
               [0.13043478, 0.16666667, 0.2          ],
               [0.23076923, 0.25925926, 0.28571429],
               [0.31034483, 0.33333333, 0.35483871],
               [0.375       , 0.39393939, 0.41176471],
               [0.42857143, 0.44444444, 0.45945946]])
```

```
In [67]: b = b.reshape((3,6))
         b
```

```
Out[67]: array([[20, 21, 22, 23, 24, 25],
               [26, 27, 28, 29, 30, 31],
               [32, 33, 34, 35, 36, 37]])
```

```
In [57]: a@b
```

```
Out[57]: array([[ 90,  93,  96,  99, 102, 105],
               [324, 336, 348, 360, 372, 384],
               [558, 579, 600, 621, 642, 663],
               [792, 822, 852, 882, 912, 942],
               [1026, 1065, 1104, 1143, 1182, 1221],
               [1260, 1308, 1356, 1404, 1452, 1500]])
```

```
In [58]: a.dot(b)
```

```
Out[58]: array([[ 90,   93,   96,   99,  102,  105],
 [ 324,  336,  348,  360,  372,  384],
 [ 558,  579,  600,  621,  642,  663],
 [ 792,  822,  852,  882,  912,  942],
 [1026, 1065, 1104, 1143, 1182, 1221],
 [1260, 1308, 1356, 1404, 1452, 1500]])
```

```
In [59]: b.max()
```

```
Out[59]: 37
```

```
In [60]: b.min()
```

```
Out[60]: 20
```

```
In [61]: b.argmax()
```

```
Out[61]: 17
```

```
In [62]: np.sum(b)
```

```
Out[62]: 513
```

```
In [63]: np.sum(b, axis = 1)
```

```
Out[63]: array([135, 171, 207])
```

```
In [64]: np.sum(b, axis = 0)
```

```
Out[64]: array([78, 81, 84, 87, 90, 93])
```

```
In [65]: np.mean(b)
```

```
Out[65]: 28.5
```

```
In [66]: np.sqrt(b)
```

```
Out[66]: array([[4.47213595, 4.58257569, 4.69041576, 4.79583152, 4.89897949,
 5.          ],
 [5.09901951, 5.19615242, 5.29150262, 5.38516481, 5.47722558,
 5.56776436],
 [5.65685425, 5.74456265, 5.83095189, 5.91607978, 6.          ,
 6.08276253]])
```

```
In [69]: np.std(b)
```

```
Out[69]: 5.188127472091127
```

```
In [70]: np.log(b)
```

```
Out[70]: array([[2.99573227, 3.04452244, 3.09104245, 3.13549422, 3.17805383,
 3.21887582],
 [3.25809654, 3.29583687, 3.33220451, 3.36729583, 3.40119738,
 3.4339872 ],
 [3.4657359 , 3.49650756, 3.52636052, 3.55534806, 3.58351894,
 3.61091791]])
```

```
In [74]: import matplotlib.pyplot as plt
```

```
In [75]: np.pi
```

Out[75]: 3.141592653589793

```
In [77]: np.sin(np.pi/2)
```

Out[77]: 1.0

```
In [78]: np.sin(np.pi/6)
```

Out[78]: 0.49999999999999994

```
In [79]: np.cos(np.pi/2)
```

Out[79]: 6.123233995736766e-17

```
In [80]: np.tan(np.pi/2)
```

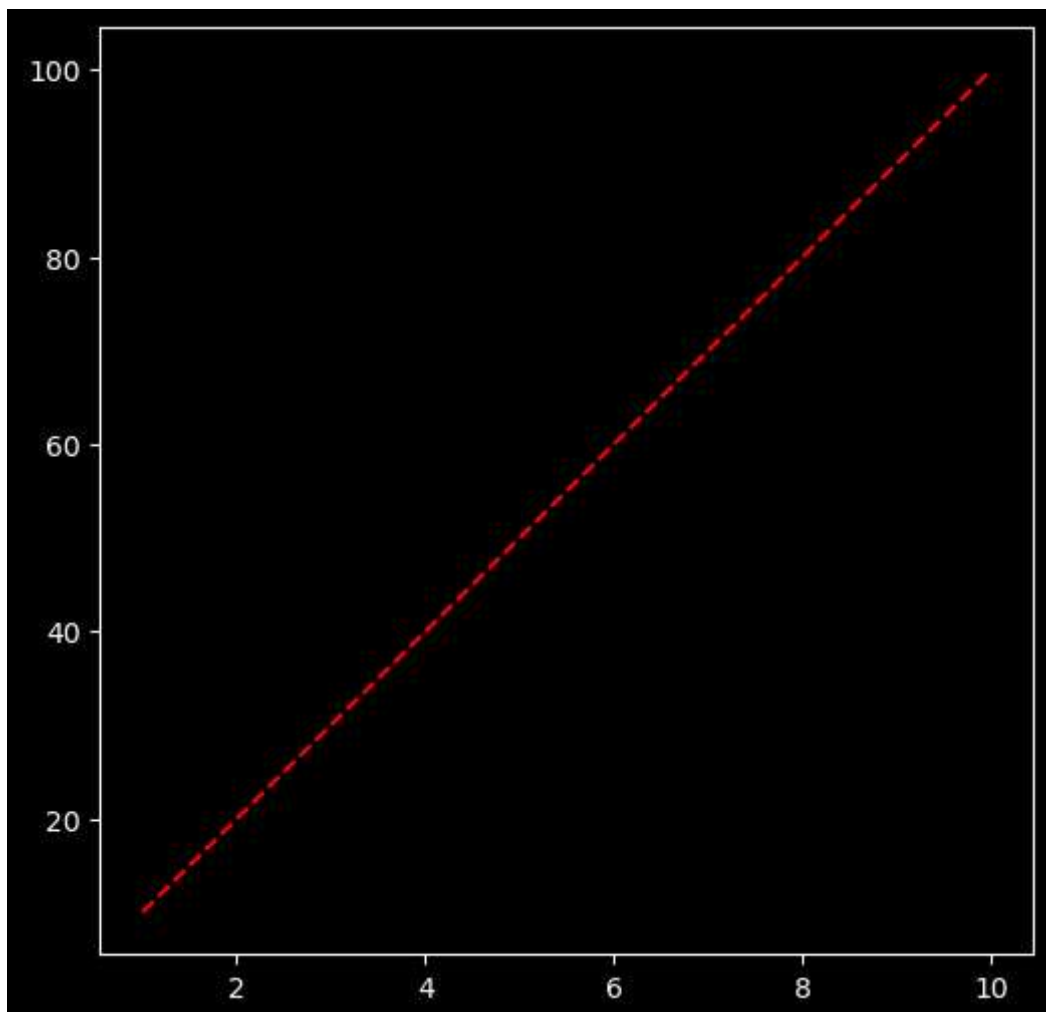
Out[80]: 1.633123935319537e+16

```
In [81]: np.tan(0)
```

Out[81]: 0.0

```
In [82]: x = np.arange(1,11)
y = np.arange(10,110,10)

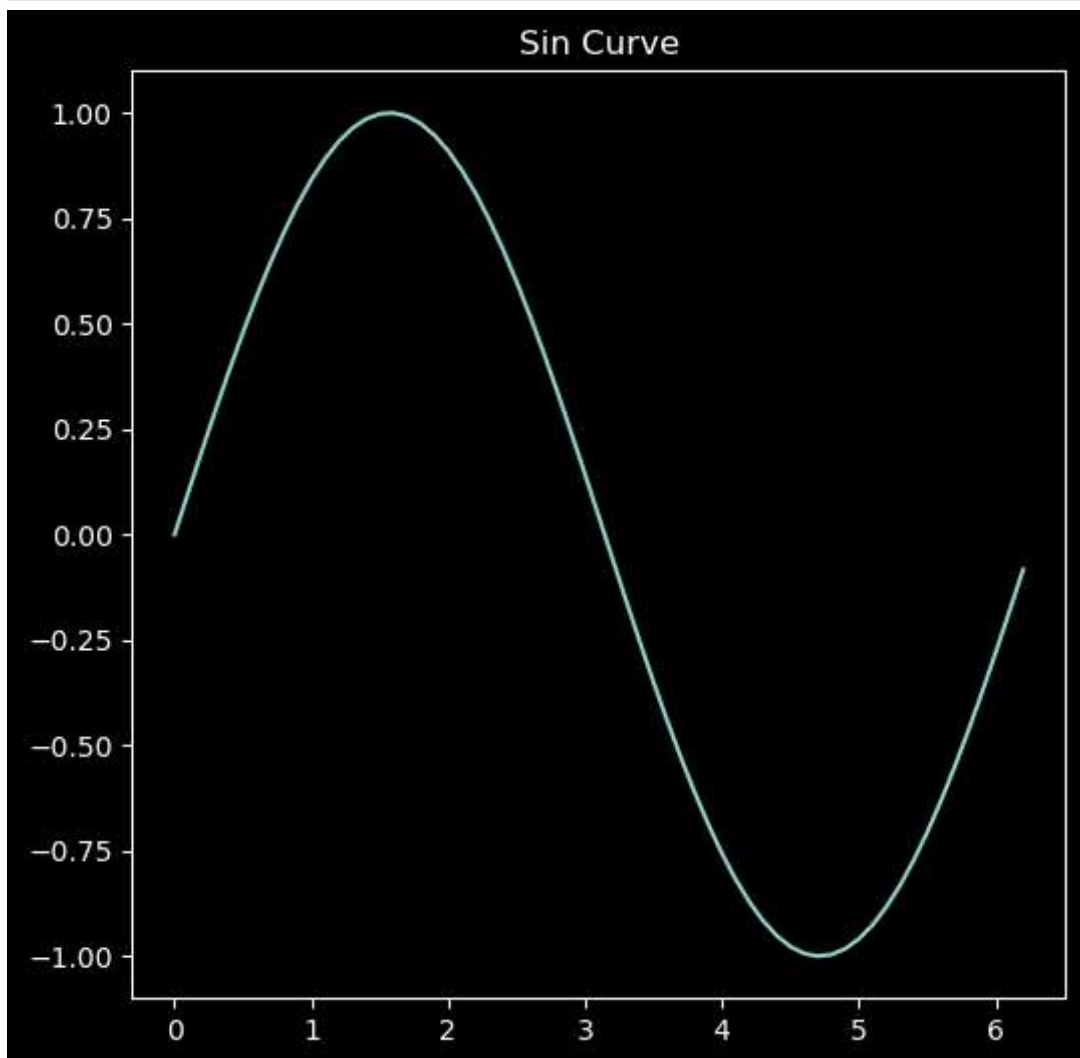
plt.figure(figsize = (6,6))
plt.plot(x,y, 'r--')
plt.show()
```




```
In [83]: x_sin = np.arange(0,2*np.pi, 0.1)
y_sin = np.sin(x_sin)
print(y_sin)
```

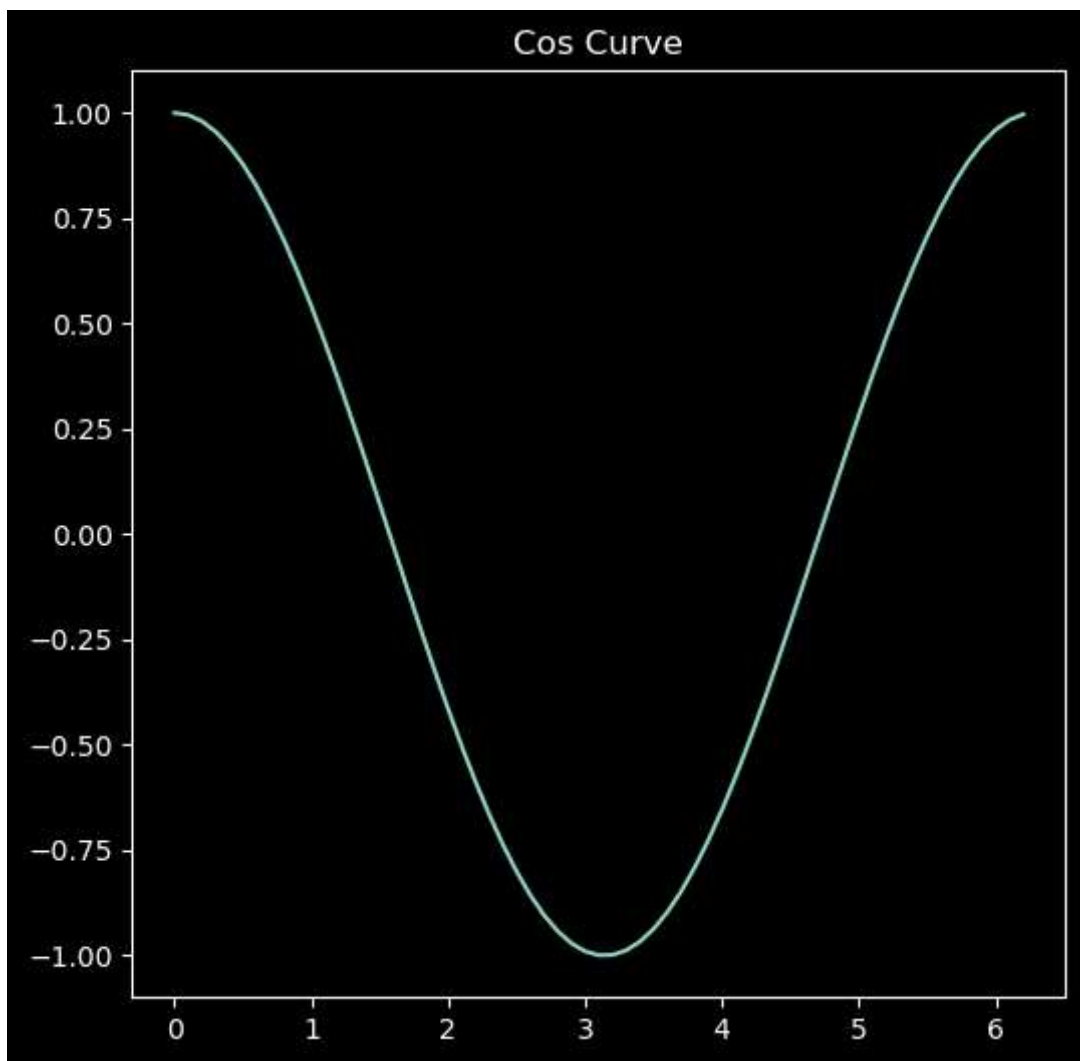
```
[ 0.          0.09983342  0.19866933  0.29552021  0.38941834  0.47942554
 0.56464247  0.64421769  0.71735609  0.78332691  0.84147098  0.89120736
 0.93203909  0.96355819  0.98544973  0.99749499  0.9995736   0.99166481
 0.97384763  0.94630009  0.90929743  0.86320937  0.8084964   0.74570521
 0.67546318  0.59847214  0.51550137  0.42737988  0.33498815  0.23924933
 0.14112001  0.04158066 -0.05837414 -0.15774569 -0.2555411  -0.35078323
-0.44252044 -0.52983614 -0.61185789 -0.68776616 -0.7568025  -0.81827711
-0.87157577 -0.91616594 -0.95160207 -0.97753012 -0.993691   -0.99992326
-0.99616461 -0.98245261 -0.95892427 -0.92581468 -0.88345466 -0.83226744
-0.77276449 -0.70554033 -0.63126664 -0.55068554 -0.46460218 -0.37387666
-0.2794155  -0.1821625  -0.0830894 ]
```

```
In [84]: plt.figure(figsize = (6,6))
plt.plot(x_sin, y_sin)
plt.title("Sin Curve")
plt.show()
```



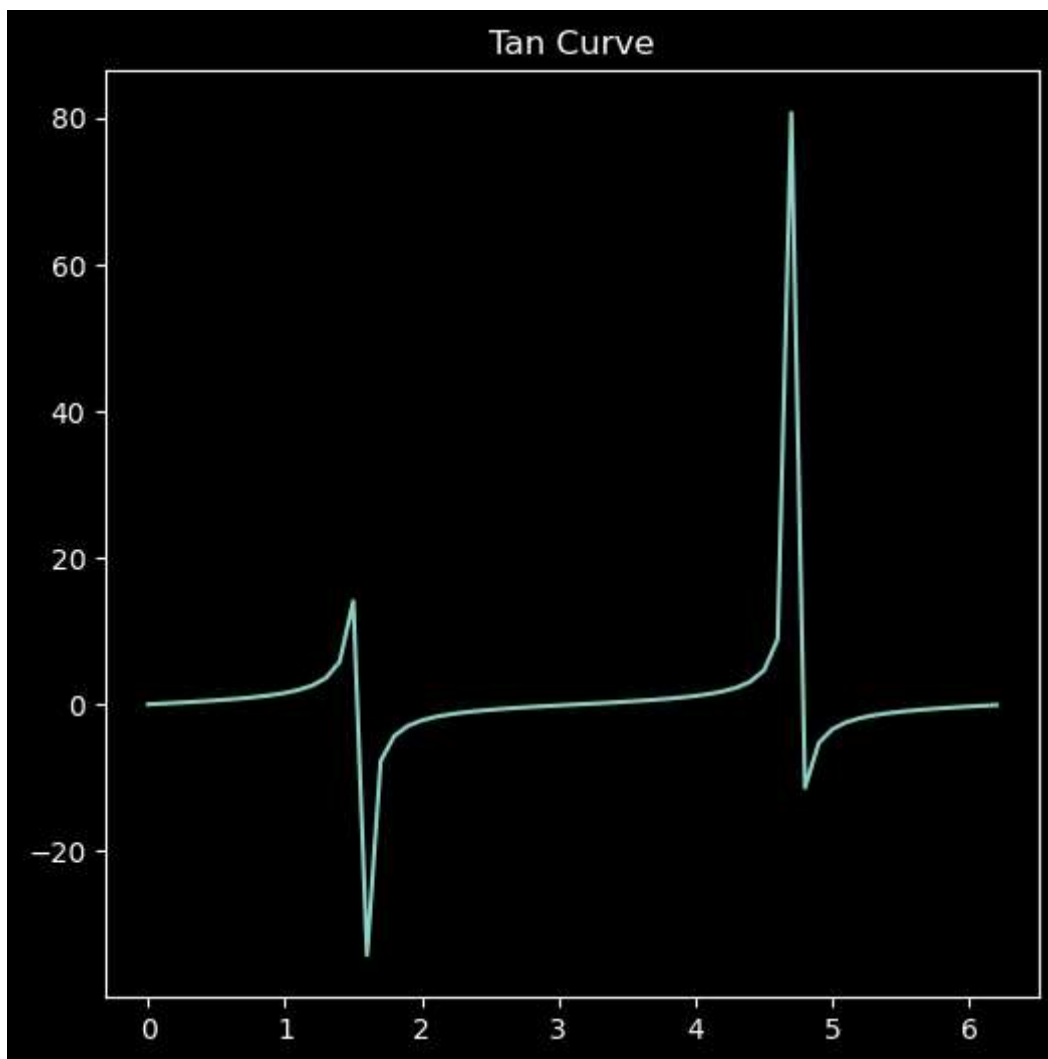
```
In [85]: x_cos = np.arange(0, 2*np.pi, 0.1)
y_cos = np.cos(x_cos)

plt.figure(figsize = (6,6))
plt.plot(x_cos, y_cos)
plt.title("Cos Curve")
plt.show()
```



```
In [86]: x_tan = np.arange(0, 2*np.pi, 0.1)
y_tan = np.tan(x_tan)

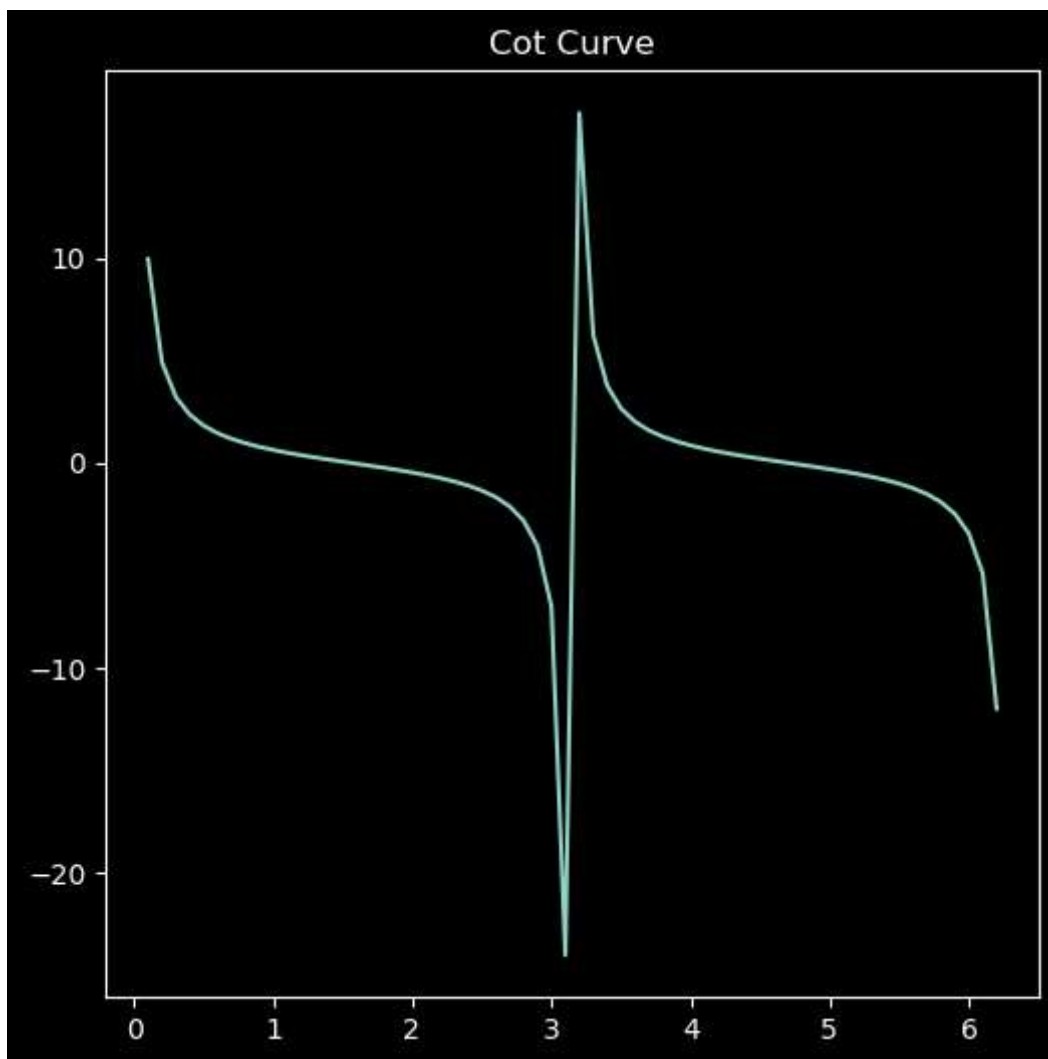
plt.figure(figsize = (6,6))
plt.plot(x_tan, y_tan)
plt.title("Tan Curve")
plt.show()
```



```
In [89]: x_cot = np.arange(0, 2*np.pi, 0.1)
y_cot = 1/np.tan(x_cot)
```

```
plt.figure(figsize = (6,6))
plt.plot(x_cot, y_cot)
plt.title("Cot Curve")
plt.show()
```

C:\Users\harsh\AppData\Local\Temp\ipykernel_13940\2097634267.py:2: RuntimeWarning: divide by zero encountered in true_divide
y_cot = 1/np.tan(x_cot)



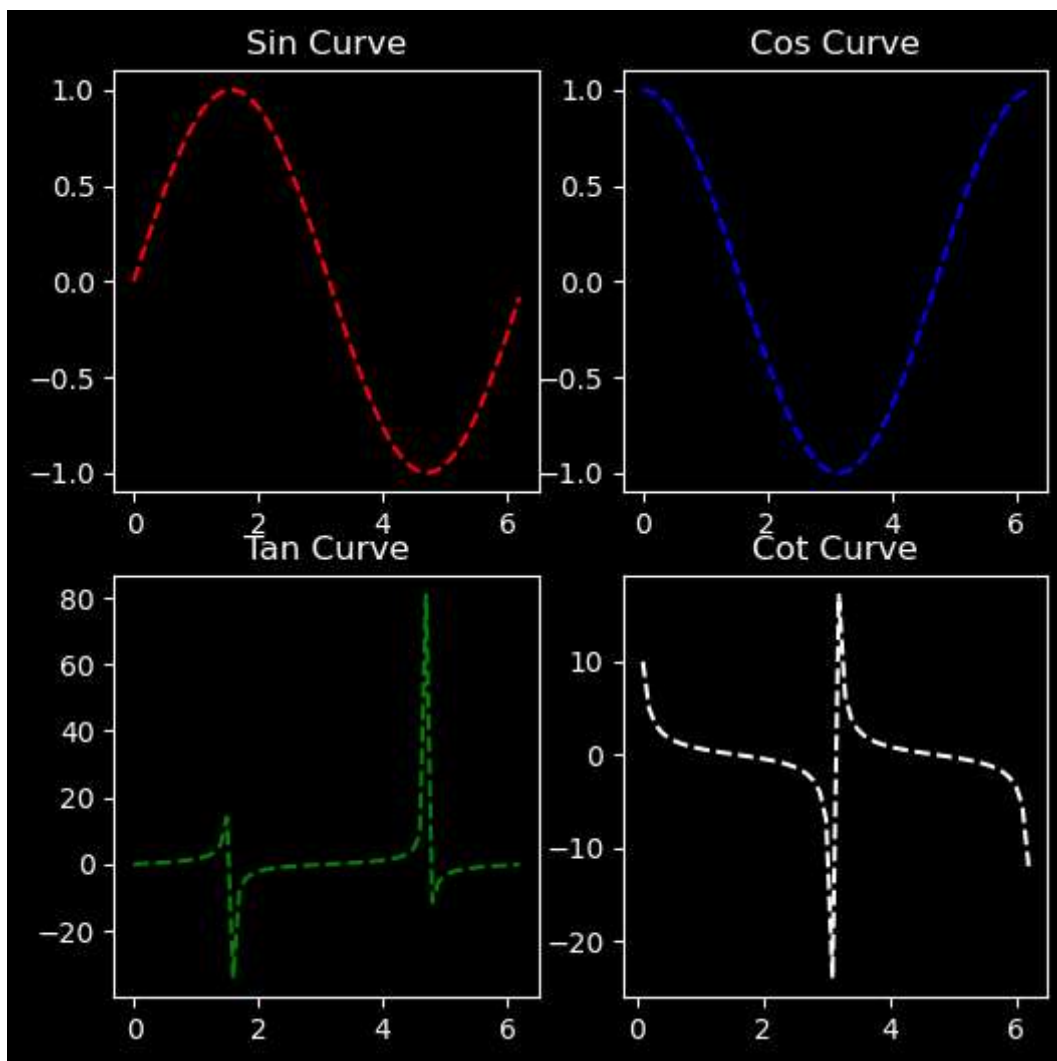
```
In [91]: plt.figure(figsize = (6,6))
plt.subplot(2,2,1)
plt.plot(x_sin, y_sin, 'r--')
plt.title("Sin Curve")

plt.subplot(2,2,2)
plt.plot(x_cos, y_cos, 'b--')
plt.title("Cos Curve")

plt.subplot(2,2,3)
plt.plot(x_tan, y_tan, 'g--')
plt.title("Tan Curve")

plt.subplot(2,2,4)
plt.plot(x_cot, y_cot, 'w--')
plt.title("Cot Curve")

plt.show()
```



In [92]: `np.random.random(1)`

Out[92]: `array([0.56551124])`

In [93]: `np.random.random(2)`

Out[93]: `array([0.58410266, 0.98237085])`

In [94]: `np.random.random((2,2))`

Out[94]: `array([[0.8050742 , 0.97396635],
[0.9301217 , 0.02317878]])`

In [98]: `np.random.randint(1,10)`

Out[98]: `7`

In [99]: `np.random.randint(1,10, (2,2))`

Out[99]: `array([[8, 4],
[4, 2]])`

In [100]: `np.random.randint(1,10, (3,4,5))`

```
Out[100]: array([[2, 5, 2, 5, 3],
                [6, 5, 4, 4, 8],
                [5, 3, 2, 4, 2],
                [3, 7, 6, 3, 6]],

                [[5, 6, 7, 4, 6],
                [2, 9, 8, 3, 2],
                [7, 7, 3, 9, 4],
                [4, 3, 9, 7, 5]],

                [[6, 3, 3, 8, 1],
                [6, 8, 1, 8, 8],
                [4, 5, 9, 6, 8],
                [9, 4, 8, 9, 9]]])
```

```
In [101... np.random.rand(2,2)
```

```
Out[101]: array([[0.0640245 , 0.44922509],
                [0.94247591, 0.41373529]])
```

```
In [102... np.random.randn(2,2)
```

```
Out[102]: array([[ 0.17570645, -0.08107532],
                [-0.27695528, -1.44560249]])
```

```
In [104... a = np.arange(1,10)
print(a)
```

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

```
In [105... np.random.choice(a)
```

```
Out[105]: 5
```

```
In [109... s1 = "Harshit is my name "
s2 = "I am an Indian"
```

```
In [110... np.char.add(s1, s2)
```

```
Out[110]: array('Harshit is my name I am an Indian', dtype='<U33')
```

```
In [111... np.char.upper(s1)
```

```
Out[111]: array('HARSHIT IS MY NAME ', dtype='<U19')
```

```
In [112... np.char.lower(s1)
```

```
Out[112]: array('harshit is my name ', dtype='<U19')
```

```
In [113... np.char.split(s1)
```

```
Out[113]: array(list(['Harshit', 'is', 'my', 'name']), dtype=object)
```

```
In [114... s3 = "Harshit is my\nname"
np.char.splitlines(s3)
```

```
Out[114]: array(list(['Harshit is my', 'name']), dtype=object)
```

```
In [115... np.char.replace(s1, 'name', 'sirname')
```

```
Out[115]: array('Harshit is my sirname ', dtype='<U22')
```

```
In [116... print("*****good bye*****")
```

```
*****good bye*****
```

```
In [117... print(np.char.center('good bye', 80, "*"))
```

```
*****good bye*****
```

```
In [ ]:
```