In [104…

```
# Area under the curve f(x) = sqrt(25 - x^2);
import numpy as np;
def f(x):
    return np.sqrt(25 - x**2);

a = int(input('Enter the upper limit for integration: '));
b = int(input('Enter the lower limit for integration: '));
n = int(input('Enter the value of n: '));
h = (a - b)/n;
print('h = ',h);
s = 0;
for i in range(n):
    x_i = b + i*h;
    x_i2 = x_i + h;
    s += f(x_i) + f(x_i2);
result = h/2*(s);
print(result);
```

```
h =  0.5
19.40323953905199
```

In [108…

```
#AUC with approximation error
import numpy as np;
import matplotlib.pyplot as plt;

def f(x):
    return np.sqrt(25 - x**2);

actual_area = (np.pi * 25) / 4;
a, b = 0, 5;
h_values = [];
errors = [];
h = 1;

while h > 0.001:
    n = int((b-a)/h);
    xi = np.linspace(a, b, n+1);
    yi = f(xi);

    Ah = (h/2)* np.sum(yi[:-1] + yi[1:]);

    error = abs(actual_area - Ah);

    h_values.append(h);
    errors.append(error);
    print(f"h = {h:.5f}, Ah = {Ah:.6f}, Error = {error:.6f}");
    h /= 2;
```

```
Matplotlib is building the font cache; this may take a moment.
```

```
h = 1.00000, Ah = 18.981555, Error = 0.653399
h = 0.50000, Ah = 19.403240, Error = 0.231715
h = 0.25000, Ah = 19.552905, Error = 0.082049
h = 0.12500, Ah = 19.605923, Error = 0.029031
h = 0.06250, Ah = 19.624686, Error = 0.010268
h = 0.03125, Ah = 19.631323, Error = 0.003631
h = 0.01562, Ah = 19.633670, Error = 0.001284
h = 0.00781, Ah = 19.634500, Error = 0.000454
h = 0.00391, Ah = 19.634794, Error = 0.000160
h = 0.00195, Ah = 19.634897, Error = 0.000057
```