

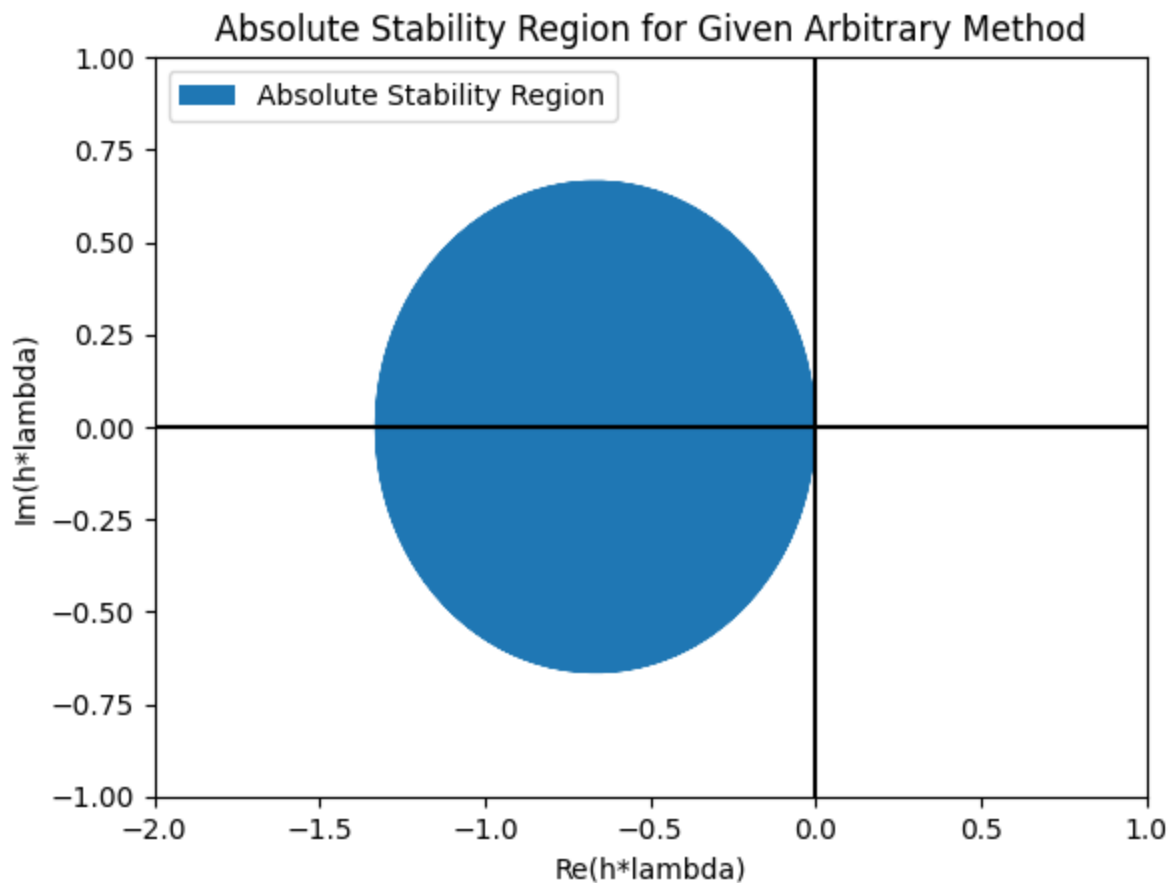
```
In [ ]: import numpy as np
import matplotlib.pyplot as plt
from numpy import exp
```

Question 1

```
In [ ]: theta = np.arange(0, 2*np.pi+np.pi/100, np.pi/100)

z = (1*exp(2*(1j*theta)) - 1) / (.5*exp(1j*theta) + 1.5)
z_real = z.real
z_imag = z.imag

plt.fill(z_real, z_imag, label='Absolute Stability Region')
plt.axhline(y=0, color='k')
plt.axvline(x=0, color='k')
plt.xlim(-2, 1)
plt.ylim(-1, 1)
plt.xlabel('Re(h*lambda)')
plt.ylabel('Im(h*lambda)')
plt.legend()
plt.title('Absolute Stability Region for Given Arbitrary Method')
plt.show()
```



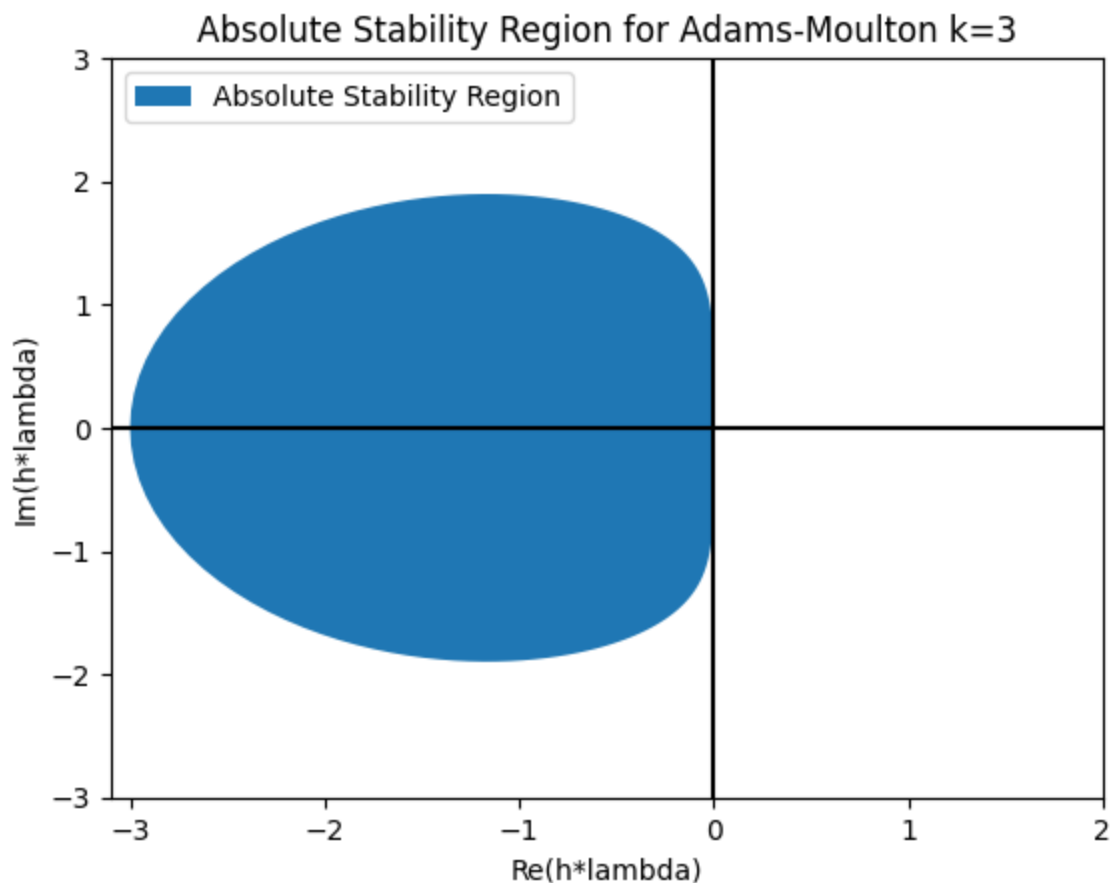
Question 2

Adams-Moulton method

```
In [ ]: theta = np.arange(0,2*np.pi+np.pi/100,np.pi/100)

z = (exp(3j*theta) - exp(2j*theta)) / (1/24 * (9*exp(3j*theta) + 19*exp(2j*theta) - 5*exp(j*theta)))
z_real = z.real
z_imag = z.imag

plt.fill(z_real,z_imag, label='Absolute Stability Region')
plt.axhline(y=0, color='k')
plt.axvline(x=0, color='k')
plt.xlim(-3.1,2)
plt.ylim(-3,3)
plt.xlabel('Re(h*lambda)')
plt.ylabel('Im(h*lambda)')
plt.title('Absolute Stability Region for Adams-Moulton k=3')
plt.legend()
plt.show()
```



Adams-Bashforth

```
In [ ]: theta = np.arange(0,2*np.pi+np.pi/100,np.pi/100)

z = (exp(3j*theta) - exp(2j*theta)) / (1/12 * (23*exp(2j*theta) - 16*exp(1j*theta) + 5))
z_real = z.real
z_imag = z.imag

plt.fill(z_real,z_imag, label='Absolute Stability Region')
plt.axhline(y=0, color='k')
plt.axvline(x=0, color='k')
plt.xlim(-1,1)
plt.ylim(-2,2)
plt.xlabel('Re(h*lambda)')
plt.ylabel('Im(h*lambda)')
plt.title('Absolute Stability Region for Adams-Bashforth k=3')
plt.legend()
plt.show()
```

```
plt.legend()  
plt.show()
```

