Solving Oscillatory Equation Using Euler's Method

1 Introduction

If we use Euler's Method to solve an oscillatory equation, it gives an unstable solution. We can just verify that by observing the z-t graph. Over time amplitude is increasing.

2 Python Script

```python
import matplotlib.pyplot as plt

def f(t, z, w):
    return 1j*w*z

w = 2 # frequency
t0 = 0 # initial time
tf = 10 # final time
h = 0.01 # step size
z0 = 1 # initial value of z

# Initializing arrays for t and z
t = [t0]
z = [z0]

for i in range(int((tf-t0)/h)):
    z_next = z[-1] + h*f(t[-1], z[-1], w)
    t_next = t[-1] + h
    z.append(z_next)
    t.append(t_next)

plt.plot(t, z)
plt.xlabel('time')
plt.ylabel('z')
plt.title('Euler Method for dz/dt = i*w*z')
plt.show()
```