Second Week Exercise

Abhishek Daniel

Exercise

Let $z = \frac{1-i}{1+i}$, where $z \in \mathbb{C}$

1) Real and imaginary components of z

$$z = \frac{1-i}{1+i} \times \frac{1-i}{1-i}$$
$$= \frac{-2i}{2}$$
$$z = -i$$

Therefore, $Re\ z = 0$ and $Im\ z = -1$

2) Magnitude of z

The magnitude of a complex number z is given by

$$|z| = \sqrt{x^2 + y^2}$$

Where $x = Re\ z = 0$ and the $y = Im\ z = -1$. Therefore, $|z| = 1$

3) Phase of z

The phase of a complex number,z is given by

$$\varphi = 2\arctan\left(\frac{y}{\sqrt{x^2+y^2}+x}\right)$$
$$= 2\arctan(-1)$$
$$= -2\frac{\pi}{4}$$
$$\varphi = -\frac{\pi}{2} \approx -1.571$$

4) Python program

```python
import cmath as cm

z_1 = complex(1,-1)
z_2 = complex(1,1)

z = z_1 / z_2

print('z = ', z)
print('*********************************')

#To get the real and imaginary components of z

print('Real part = ', z.real)
print('Imaginary part = ', z.imag)
print('*********************************')

#To find the magnitude of z
mod = abs(z)
print('Magnitude = ', mod)
print('*********************************')

#To find the phase of z
p = cm.phase(z)
print('Phase = ', p)
```

```
z =   -1j
*********************************
Real part =  0.0
Imaginary part =  -1.0
*********************************
Magnitude =  1.0
*********************************
Phase =  -1.5707963267948966
```