Answer on Question #58283 – Math – Complex Analysis

The polar form of the complex number

$$z = x + iy$$

is given by

Solution:

The polar form of the complex number **z** is

$$z = r(\cos\varphi + i\sin\varphi)$$

where

$r = |z| = \sqrt{x^2 + y^2}$ is the absolute value of the complex number z

and

φ=arg(z) is the argument of the complex number z:

$$\varphi = \arg(x + iy) = \begin{cases} \arctan\left(\frac{y}{x}\right) & if\ x > 0 \\ \pi + \arctan\left(\frac{y}{x}\right) & if\ x < 0\ and\ y \geq 0 \\ -\pi + \arctan\left(\frac{y}{x}\right) & if\ x < 0\ and\ y < 0 \\ \frac{\pi}{2} & if\ x = 0\ and\ y > 0 \\ -\frac{\pi}{2} & if\ x = 0\ and\ y < 0 \\ indeterminate & if\ x = 0\ and\ y = 0 \end{cases}$$

Answer: $z = \sqrt{x^2 + y^2}(\cos[\arg(x + iy)] + i\sin[\arg(x + iy)])$