

8.5. PROCEDIMIENTO

8.5.1. Transforme a su forma polar:

$$C = \sqrt{A^2 + B^2}$$

$$\theta = \tan^{-1}\left(\frac{B}{A}\right)$$

$$a) 2 + j3 = C = \sqrt{2^2 + 3^2} = 3.60$$

$$\theta = \tan^{-1}\left(\frac{3}{2}\right) = 56.30$$

$$3.60 < 56.30$$

$$b) -8 + j6.2 = C = \sqrt{(-8)^2 + 6.2^2} = 10.12$$

$$\theta = \tan^{-1}\left(\frac{6.2}{-8}\right) = -37.78$$

$$10.12 < -37.78$$

$$c) 4.3 - j2.8 = C = \sqrt{4.3^2 + (-2.8)^2} = 5.13$$

$$\theta = \tan^{-1}\left(\frac{-2.8}{4.3}\right) = -33$$

$$5.13 < -33$$

$$d) -6 - 3.2j = C = \sqrt{(-6)^2 + (-3.2)^2} = 6.8$$

$$\theta = \tan^{-1}\left(\frac{-3.2}{-6}\right) = 28.07$$

$$6.8 < 28.07$$

8.5.2 Transforme a su forma rectangular:

$$A = C \cdot \cos(\theta)$$

$$B = C \cdot \sin(\theta)$$

$$a) 36 < -10 = A = 36 \cdot \cos(-10) = 35.45$$

$$B = 36 \cdot \sin(-10) = -j6.25$$

$$35.45 - j6.25$$

$$b) 28.7 < 135 = A = 28.7 \cdot \cos(135) = -20.3$$

$$B = 28.7 \cdot \sin(135) = j20.3$$

$$-20.3 + j20.3$$

$$c) 11.2 < 28 = A = 11.2 \cdot \cos(28) = 9.9$$

$$B = 11.2 \cdot \sin(28) = j5.26$$

$$9.9 + j5.26$$

$$d) 45 < -117.9 = A = 45 \cdot \cos(-117.9) = -21.05$$

$$B = 45 \cdot \sin(-117.9) = -j39.77$$

$$-21.05 - j39.77$$

8.5.3. Realice las siguientes operaciones paso a paso, y represente el resultado tanto en su forma rectangular como en su forma polar.

$$a) \frac{10+j3}{10-j2} - (7+j2)(3 < -115) =$$

Transformando a polar

$$C = \sqrt{10^2 + 3^2} = 10.44 \quad ; \quad \theta = \tan^{-1}\left(\frac{3}{10}\right) = 16.7$$

$$10.44 < 16.7$$

$$C = \sqrt{10^2 + (-2)^2} = 10.19 \quad ; \quad \theta = \tan^{-1}\left(\frac{-2}{10}\right) = -11.30$$

$$10.19 < -11.30$$

$$C = \sqrt{7^2 + 2^2} = 7.28 \quad ; \quad \theta = \tan^{-1}\left(\frac{2}{7}\right) = 15.94$$

$$7.28 < 15.94$$

Reemplazando

$$\frac{10.44 < 16.7}{10.19 < -11.30} - (7.28 < 15.94)(3 < -115) =$$

$$\frac{10.44}{10.19} < 16.7 - (-11.30) - 7.28 * 3 < 15.94 + (-115) =$$

$$1.02 < 28 - 21.84 < -99.06 =$$

Volviendo a transformar a rectangular para la resta

$$A = 1.02 * \cos(28) = 0.90$$

$$B = 1.02 * \sin(28) = 0.47$$

$$0.90 + j0.47$$

$$A = 21.84 * \cos(-99.06) = -99.06$$

$$B = 21.84 * \sin(-99.06) = -21.56$$

$$-99.06-j21.56$$

Realizando la resta

$$0.90 + j0.47 - (-99.06) - j21.56 =$$

Rectangular: $99.96 + j22.03$

$$\text{Polar: } C = \sqrt{(99.96)^2 + 22.03^2} = 102.36 \quad ; \quad \theta = \tan^{-1}\left(\frac{22.03}{99.96}\right) = 12.42$$

$$102.36 < 12.42$$

$$b) 6.8 < 125.3 + \frac{4.5 \angle -11.5}{7.6 \angle -1.2} =$$

Transformando a polar

$$C = \sqrt{(7.6)^2 + (-1.2)^2} = 7.69 \quad ; \quad \theta = \tan^{-1}\left(\frac{-1.2}{7.6}\right) = -8.97$$

$$7.69 < -8.97$$

Reemplazando

$$6.8 < 125.3 + \frac{4.5 \angle -11.5}{7.69 \angle -8.97} =$$

$$6.8 < 125.3 + \left(\frac{4.5}{7.69} \angle -11.5 - (-8.97)\right) =$$

$$6.8 < 125.3 + (0.58 \angle -2.53)$$

Volviendo a transformar a rectangular para la suma

$$A = 6.8 * \cos(125.3) = -3.92$$

$$B = 6.8 * \sin(125.3) = 5.55$$

$$-3.92+j5.55$$

$$A = 0.58 * \cos(-2.53) = 0.57$$

$$B = 0.58 * \sin(-2.53) = -0.02$$

$$0.57-j0.02$$

Reemplazando

$$-3.92 + j5.55 + 0.57 - j0.02$$

Rectangular: $-3.35+j5.53$

$$\text{Polar: } C = \sqrt{(-3.35)^2 + 5.53^2} = 6.46 \quad ; \quad \theta = \tan^{-1}\left(\frac{5.53}{-3.35}\right) = -58.79$$

$$6.46\angle-58.79$$

$$c) \frac{34+j28.5}{4\angle-20.8} - 51.2\angle 215 =$$

Transformando a polar

$$C = \sqrt{34^2 + 28.5^2} = 44.36 \quad ; \quad \theta = \tan^{-1}\left(\frac{28.5}{34}\right) = 39.97$$

$$44.36\angle 39.97$$

Reemplazando

$$\frac{44.36\angle 39.97}{4\angle-20.8} - 51.2\angle 215 =$$

$$\frac{44.36}{4} \angle 39.97 - (-20.8) - 51.2\angle 215 =$$

$$11.09 \angle 60.77 - 51.2\angle 215 =$$

Volviendo a transformar a rectangular para la suma

$$A = 11.09 * \cos(60.77) = 5.41$$

$$B = 11.09 * \sin(60.77) = 9.67$$

$$5.41+j9.67$$

$$A = 51.2 * \cos(215) = -293.67$$

$$B = 51.2 * \sin(215) = -419.40$$

$$-296.67-j419.40$$

Reemplazando

$$5.41 + j9.67 - (-296.67 - j419.40) =$$

Rectangular: $302.08 + j429.07$

$$\text{Polar: } C = \sqrt{302.08^2 + 429.07^2} = 524.74 \quad ; \quad \theta = \tan^{-1}\left(\frac{429.07}{302.08}\right) = 54.85$$

$$524.74 \angle 54.85$$

8.5.4 Resuelva las operaciones anteriores por medio de la calculadora y compare resultados.

Link de la calculadora: <https://www.matesfacil.com/ejercicios-resueltos-producto-complejos.html>

a)

Calculadora:

$$z_1 = \boxed{0.90} + \boxed{0.47} \cdot i$$

$$z_2 = \boxed{-99.06} + \boxed{-21.56} \cdot i$$

Sumar

Restar

Multiplicar

Dividir

La resta de los complejos es

$$\begin{aligned} (0.9 + 0.47i) - (-99.06 - 21.56i) &= \\ = (0.9 - (-99.06)) + (0.47 - (-21.56))i &= \\ = 99.96 + 22.03i \end{aligned}$$

b)

Calculadora:

$$z_1 = \boxed{-3.92} + \boxed{5.55} \cdot i$$

$$z_2 = \boxed{0.57} + \boxed{-0.02} \cdot i$$

Sumar

Restar

Multiplicar

Dividir

La suma de los complejos es

$$\begin{aligned} (-3.92 + 5.55i) + (0.57 - 0.02i) &= \\ = (-3.92 + 0.57) + (5.55 - 0.02)i &= \\ = -3.35 + 5.53i \end{aligned}$$

c)

Calculadora:

$$z_1 = \boxed{5.41} + \boxed{9.67} \cdot i$$

$$z_2 = \boxed{-296.67} + \boxed{-419.40} \cdot i$$

Sumar

Restar

Multiplicar

Dividir

La resta de los complejos es

$$\begin{aligned} & (5.41 + 9.67i) - (-296.67 - 419.4i) = \\ & = (5.41 - (-296.67)) + (9.67 - (-419.4))i = \\ & = 302.08 + 429.07i \end{aligned}$$