8.5.1. Transforme a su forma polar:

$$a)\ 2 + 3j =$$

$$r = \sqrt{(2)^2 + (3)^2} = \sqrt{13}$$

$$\theta = \tan^{-1}\left(\frac{3}{2}\right) = 56.3099°$$

$$2 + 3j = \sqrt{13}\angle56.3099°$$

$$b)\ -8 + 6.2j =$$

$$r = \sqrt{(-8)^2 + (6.2)^2} = 10.1213$$

$$\theta = \tan^{-1}\left(\frac{6.2}{-8}\right) = -37.7757°$$

$$\theta = 180 - 37.7757 = 142.2243°$$

$$-8 + 6.2j = 10.1213\angle142.2243°$$

$$c)\ 4.3 - 2.8j =$$

$$r = \sqrt{(4.3)^2 + (-2.8)^2} = 5.1313$$

$$\theta = \tan^{-1}\left(-\frac{2.8}{4.3}\right) = 33.0707°$$

$$\theta = 360 - 33.0707 = 326.9293°$$

$$4.3 - 2.8j = 5.1313\angle326.9293°$$

$$d)\ -6 - 3.2j =$$

$$r = \sqrt{(-6)^2 + (-3.2)^2} = 6.8$$

$$\theta = \tan^{-1}\left(\frac{3.2}{6}\right) = 28.0725°$$

$$\theta = 180 + 28.0725 = 208.0725°$$

$$-6 - 3.2j = 6.8\angle208.0725°$$

8.5.2. Transforme a su forma rectangular:

$$a)\ 36\angle-10° =$$

$$a = 36\cos(-10) = 35.4531$$

$$b = 36\sin(-10) = -6.2513$$

$$36\angle-10° = 35.4531 - 6.2513j$$

$$b)\ 28.7\angle 135° =$$

$$a = 28.7\cos(135) = -20.2939$$

$$b = 28.7\sin(135) = 20.2939$$

$$28.7\angle 135° = \boxed{-20.2939 + 20.2939j}$$

$$c)\ 11.2\angle 28° =$$

$$a = 11.2\cos(28) = 9.889$$

$$b = 11.2\sin(28) = 5.2581$$

$$11.2\angle 28° = 9.889 + 5.2581j$$

$$d)\ 45\angle -117.9°$$

$$a = 45\cos(-117.9) = -21.0568$$

$$b = 45\sin(-117.9) = -39.7695$$

$$45\angle -117.9° = \boxed{-21.0568 - 39.7695j}$$

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

$$a)\ \frac{10 + 3j}{2j} - (7 + 2j)(3\angle -115°) =$$

$$3\angle -115° = -1.2679 - 2.7189j$$

$$\frac{(10 + 3j)(-j)}{2} - (7 + 2j)(-1.2679 - 2.7189j) =$$

$$\frac{-10j - 3j^2}{2} - (-8.8753 - 19.0323j - 2.5358j + 5.4378) =$$

$$\frac{3}{2} - 5j - (-3.4375 - 21.5681j) =$$

$$\frac{3}{2} - 5j + 3.4375 + 21.5681j =$$

$$\boxed{4.9375 + 16.5681j =}$$

$$r = \sqrt{(4.9375)^2 + (16.5681)^2} = 17.2882$$

$$\theta = \tan^{-1}\left(\frac{16.5681}{4.6375}\right) = 73.4053$$

$$\boxed{17.2882\angle 73.4053°}$$

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

$$6.8\angle 125.3° = -3.9294 + 5.5497j$$

$$4.5\angle -11.5° = 4.4097 - 0.8972j$$

$$-3.9294 + 5.5497j + \frac{4.4097 - 0.8972j}{7.6 - 1.2j} =$$

$$\frac{4.4097 - 0.8972j}{7.6 - 1.2j} * \frac{7.6 + 1.2j}{7.6 + 1.2j} = \frac{33.51372 + 5.29164j - 6.81872j + 1.07664}{7.6^2 - (1.2j)^2} =$$

$$\frac{34.59036 - 1.52708j}{59.2} = 0.5843 - 0.0258j$$

$$-3.9294 + 5.5497j + 0.5843 - 0.0258j = -3.3451 + 5.5239j$$

$$r = \sqrt{(-3.3451)^2 + (5.5239)^2} = 6.4578$$

$$\theta = \tan^{-1}\left(\frac{5.5239}{-3.3451}\right) = -58.8022°$$

$$\theta = 180 - 58.8022 = 121.1978°$$

$$= 6.4578\angle 121.1978°$$

$$c) \; \frac{34 + 28.5j}{4\angle -20.8°} - 51.2\angle 215° =$$

$$4\angle -20.8° = 3.7393 - 1.4204j$$

$$-51.2\angle 215° = 41.9406 + 29.3671j$$

$$\frac{34 + 28.5j}{3.7393 - 1.4204j} + 41.9406 + 29.3671j =$$

$$\frac{34 + 28.5j}{3.7393 - 1.4204j} * \frac{3.7393 + 1.4204j}{3.7393 + 1.4204j} = \frac{127.1362 + 48.2936j + 106.57005j - 40.4814}{3.7393^2 - (1.4204j)^2} =$$

$$\frac{86.64906 + 154.86365j}{16.0021} = 5.4149 + 9.6777j$$
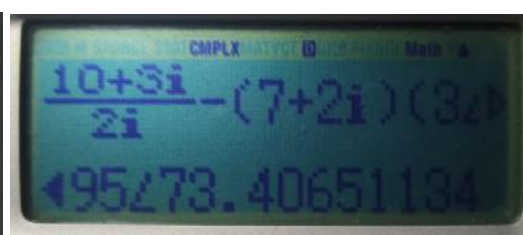
$$5.4149 + 9.6777j + 41.9406 + 29.3671j = 47.3555 + 39.0448j$$

$$r = \sqrt{47.3555^2 + 39.0448^2} = 61.3762$$

$$\theta = \tan^{-1}\left(\frac{39.0448}{47.3555}\right) = 39.5057°$$

$$= 61.3762\angle 39.5057°$$

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

Ejercicio a)

$$\frac{10+3i}{2i}-(7+2i)(3\angle$$

$$4.937136774+16.$$

$$\frac{10+3i}{2i}-(7+2i)(3\angle$$

$$74+16.5681731i$$

$$\frac{10+3i}{2i}-(7+2i)(3\angle$$

$$17.28813695\angle73.$$

$$\frac{10+3i}{2i}-(7+2i)(3\angle$$

$$95\angle73.40651134$$

Ejercicio b)

$$6.8\angle125.3+\frac{4.5\angle-}{7.6-}$$

$$-3.345141107+5.$$

$$6.8\angle125.3+\frac{4.5\angle-}{7.6-i}$$

$$07+5.523945242i$$

$$6.8\angle125.3+\frac{4.5\angle-}{7.6-i}$$

$$6.457858783\angle121$$

$$6.8\angle125.3+\frac{4.5\angle-}{7.6-i}$$

$$83\angle121.1978823$$

Ejercicio c)

$$\frac{34+28.5i}{4\angle-20.8}-51.2\angle$$

$$47.35646581+39.$$

$$\frac{34+28.5i}{4\angle-20.8}-51.2\angle$$

$$81+39.04615567i$$

$$\frac{34+28.5i}{4\angle-20.8}-51.2\angle$$

$$61.37782276\angle39.$$

$$\frac{34+28.5i}{4\angle-20.8}-51.2\angle$$

$$76\angle39.50612102$$

Cálculo de errores:

Para el ejercicio a)

$$error\ parte\ real\ (\%) = \frac{4.937136774 - 4.9375}{4.937136774} * 100 = -1.357E-3\%$$

$$error\ parte\ imaginaria\ (\%) = \frac{16.5681731 - 16.5681}{16.5681731} = 4.4121E - 6\%$$

Para el ejercicio b)

$$error\ parte\ real\ (\%) = \frac{-3.345141107 - 3.3451}{-3.345141107} * 100 = 1.1957E - 4\%$$

$$error\ parteimaginaria\ (\%) = \frac{5.523945242 - 5.5239}{5.523945242} * 100 = 8.19016E - 4\%$$

Para el ejercicio c)

$$error\ parte\ real\ (\%) = \frac{47.35646581 - 47.3555}{47.35646581} * 100 = 2.039447E - 4\%$$

$$error\ parte\ imaginaria\ (\%) = \frac{39.04615567 - 39.0448}{39.04615567} * 100 = -0.252635\%$$