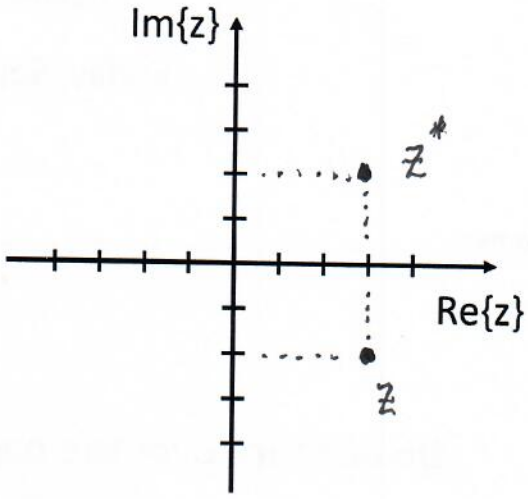
Quiz #1 - v1 Solutions

1) [4] Consider the complex number $z = 3 - 2i$.

a) Plot and label z and z^* in the complex plane to the right. The tick marks are spaced by 1.



b) Calculate $|z|^2$.

$(3+2i)(3-2i) = 9+4 = 13$

c) If we write $z = Ae^{i\theta}$, what is the value of A?

$A = |z| = \sqrt{13}$

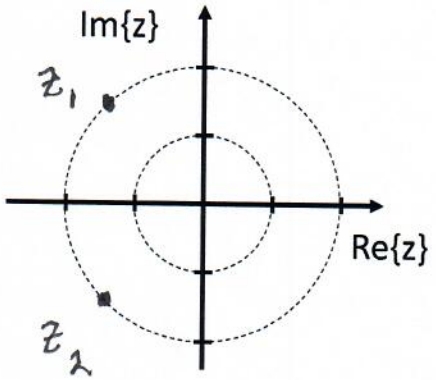
d) If we write $z = Ae^{i\theta}$, circle the correct range for the (positive) angle θ:

i) $0 < \theta < \frac{\pi}{2}$ ii) $\frac{\pi}{2} < \theta < \pi$

iii) $\pi < \theta < \frac{3\pi}{2}$ (iv) $\frac{3\pi}{2} < \theta < 2\pi$ 4th quadrant

2) [3] Consider a different complex number $z_1 = 2e^{i3\pi/4}$.

a) [1] Plot and label z_1 in the complex plane to the right. The tick marks are spaced by 1, and the dashed circles have radii of 1 and 2.



b) [1] Let $z_2 = iz_1$. Write z_2 in standard polar form.

$z_2 = e^{i\pi/2} \cdot 2e^{i3\pi/4} = 2e^{i5\pi/4}$

c) [1] Plot and label z_2 in the same complex plane to the right.

3) [3] Consider another complex number, $z = 5e^{i2\pi/3}$. For each of the following quantities, decide if it is real, imaginary, or complex, and write the corresponding letter next to the quantity:

A. purely real B. purely imaginary C. complex

a) $z + z^*$ A

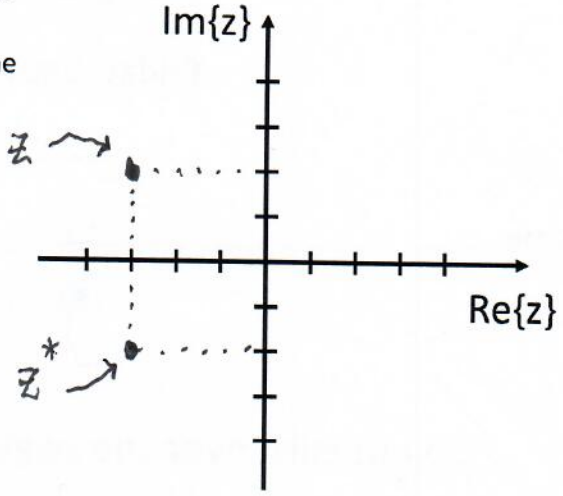
b) $z - z^*$ B

c) $|z|^2$ A

Quiz #1 - v2 Solutions

1) [4] Consider the complex number $z = -3 + 2i$.

a) Plot and label z and z^* in the complex plane to the right. The tick marks are spaced by 1.



b) Calculate $|z|^2$.

$(-3-2i)(-3+2i) = 9+4 = 13$

c) If we write $z = Ae^{i\theta}$, what is the value of A?

$A = |z| = \sqrt{13}$

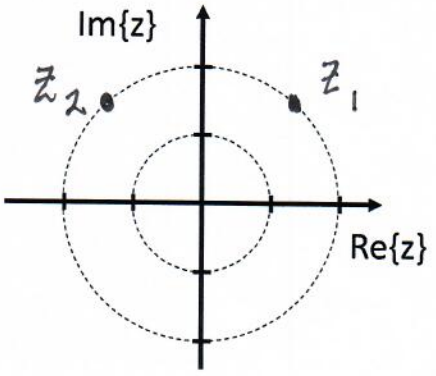
d) If we write $z = Ae^{i\theta}$, circle the correct range for the (positive) angle θ:

i) $0 < \theta < \frac{\pi}{2}$ (ii) $\frac{\pi}{2} < \theta < \pi$ 2nd quadrant

iii) $\pi < \theta < \frac{3\pi}{2}$ iv) $\frac{3\pi}{2} < \theta < 2\pi$

2) [3] Consider a different complex number $z_1 = 2e^{i\pi/4}$.

a) [1] Plot and label z_1 in the complex plane to the right. The tick marks are spaced by 1, and the dashed circles have radii of 1 and 2.



b) [1] Let $z_2 = iz_1$. Write z_2 in standard polar form.

$z_2 = e^{i\pi/2} \cdot 2e^{i\pi/4} = 2e^{i3\pi/4}$

c) [1] Plot and label z_2 in the same complex plane to the right.

3) [3] Consider another complex number, $z = 5e^{i2\pi/3}$. For each of the following quantities, decide if it is real, imaginary, or complex, and write the corresponding letter next to the quantity:

A. purely real B. purely imaginary C. complex

a) $|z|^2$ A

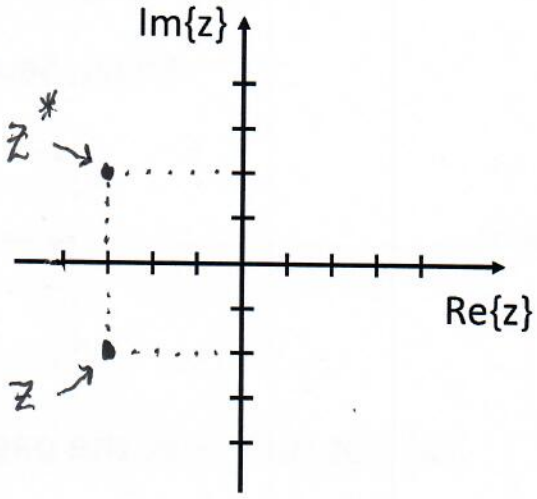
b) $z + z^*$ A

c) $z - z^*$ B

Quiz #1 - v3 Solutions

1) [4] Consider the complex number $z = -3 - 2i$.

a) Plot and label z and z^* in the complex plane to the right. The tick marks are spaced by 1.



b) Calculate $|z|^2$.

$(-3+2i)(-3-2i) = 9+4 = 13$

c) If we write $z = Ae^{i\theta}$, what is the value of A?

$A = |z| = \sqrt{13}$

d) If we write $z = Ae^{i\theta}$, circle the correct range for the (positive) angle θ:

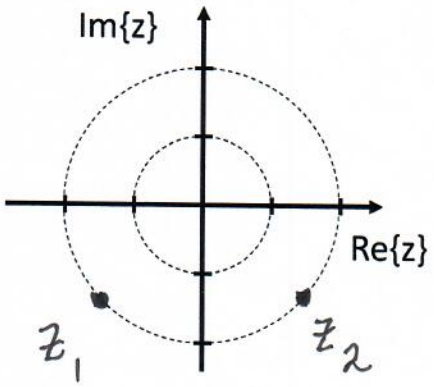
i) $0 < \theta < \frac{\pi}{2}$ ii) $\frac{\pi}{2} < \theta < \pi$

iii) $\pi < \theta < \frac{3\pi}{2}$ iv) $\frac{3\pi}{2} < \theta < 2\pi$

3rd quadrant

2) [3] Consider a different complex number $z_1 = 2e^{i5\pi/4}$.

a) [1] Plot and label z_1 in the complex plane to the right. The tick marks are spaced by 1, and the dashed circles have radii of 1 and 2.



b) [1] Let $z_2 = iz_1$. Write z_2 in standard polar form.

$z_2 = e^{i\pi/2} \cdot 2e^{i5\pi/4} = 2e^{i7\pi/4}$

c) [1] Plot and label z_2 in the same complex plane to the right.

3) [3] Consider another complex number, $z = 5e^{i2\pi/3}$. For each of the following quantities, decide if it is real, imaginary, or complex, and write the corresponding letter next to the quantity:

A. purely real B. purely imaginary C. complex

a) $z - z^*$ B

b) $z + z^*$ A

c) $|z|^2$ A