

## Complex Numbers: Complex Math (26:35)

Describe how complex numbers are formatted in both rectangular and polar format. Identify math operations that are easy or challenging for a particular format.

Describe the general process of performing addition and subtraction of complex numbers expressed in polar format.

Given the complex numbers  $\mathbf{A} = 9.0\angle 24.3^\circ$  and  $\mathbf{B} = 9.6\angle 153.4^\circ$  perform the operation  $\mathbf{A} + \mathbf{B}$ . Express final the answer in polar format.

Given the complex numbers  $\mathbf{A} = 3.1\angle -110.8^\circ$  and  $\mathbf{B} = 0.3\angle -45^\circ$  perform the operation  $\mathbf{A} - \mathbf{B}$ . Express final the answer in polar format.

Given the following complex numbers perform the indicated operations. Express the final answers in polar format:

$$\begin{array}{ll} \textcircled{1} \bar{A} = 3.1 \angle 65.1^\circ & \textcircled{2} \bar{A} = 4.3 \angle 150.4^\circ \\ \bar{B} = 7.8 \angle -108.0^\circ & \bar{B} = 9.9 \angle -38.0^\circ \\ \bar{A} + \bar{B} = & \bar{A} + \bar{B} = \\ \bar{A} - \bar{B} = & \bar{A} - \bar{B} = \end{array}$$

Discuss a method of maintaining the accuracy of results when performing manual addition and subtraction of complex numbers in polar format.

Describe the general process of performing multiplication and division of complex numbers expressed in rectangular format.

Given the complex numbers  $\mathbf{A} = -3.2 - j0.6$  and  $\mathbf{B} = -3.5 - j4.7$  perform the operation  $\mathbf{A} * \mathbf{B}$ . Express final the answer in rectangular format.

Given the complex numbers  $\mathbf{A} = 6.9 + j5.0$  and  $\mathbf{B} = 5.7 - j0.3$  perform the operation  $\mathbf{A}/\mathbf{B}$ . Express final the answer in rectangular format.

Discuss a method of maintaining the accuracy of results when performing manual multiplication or division of complex numbers in rectangular format.

Given the following complex numbers perform the indicated operations. Express the final answers in rectangular format:

$$\begin{array}{ll} \textcircled{1} \bar{A} = 9.7 + j5.8 & \textcircled{2} \bar{A} = -6.9 + j3.0 \\ \bar{B} = -3.2 - j6.5 & \bar{B} = 0.0 - j6.6 \\ \bar{A} \cdot \bar{B} = & \bar{A} \cdot \bar{B} = \\ \bar{A}/\bar{B} = & \bar{A}/\bar{B} = \end{array}$$

Determine the real, imaginary, magnitude, and angle components for the complex number  $4.3 + j8.9$

Determine the real, imaginary, magnitude, and angle components for the given complex numbers:

$$\textcircled{1} \bar{A} = 6.6 \angle 32.2^\circ$$

$$\textcircled{2} \bar{A} = 6.7 - j6.0$$

Negate the complex number  $A = 3.9 + j5.9$

Discuss what the negation looks like in comparison to the original complex number.

Negate the complex number  $A = 3.7 \angle 143.7^\circ$

Identify the preferred means of formatting negative numbers in polar format.

Form the complex conjugate of the complex number  $A = 3.9 + j5.9$

Discuss the general technique to form the complex conjugate in rectangular format.

Discuss what the complex conjugate looks like in comparison to the original complex number.

Form the complex conjugate of the complex number  $A = 3.7 \angle 143.7^\circ$

Discuss the general technique of forming the complex conjugate of a complex number in rectangular format.

Negate and form the complex conjugate of the following complex numbers:

$$\textcircled{1} \bar{A} = 2.2 + j1.8$$

$$\textcircled{2} \bar{B} = 10.9 \angle -24.2^\circ$$

Given a complex number known to be in the first quadrant with a z magnitude of 6.2 and a real horizontal x component of 1.4 determine the imaginary y component and the angle.

Given a complex number known to be in the 4<sup>th</sup> quadrant with a z magnitude of 11.6 and a real x component of 7.8 solve for the angle and the vertical imaginary Y component.

Given a complex number known to be in the 1<sup>st</sup> quadrant with a z magnitude of 5.4 and a real x component of 2.3 solve for the angle and the vertical imaginary Y component.