

## Complex Number Resources

### **Khan Academy**

([https://www.khanacademy.org/math/precalculus/imaginary\\_complex\\_precalc](https://www.khanacademy.org/math/precalculus/imaginary_complex_precalc))

There are many videos and corresponding activities which address various aspects of complex number algebra (adding, subtracting, multiplying, dividing, complex conjugates, absolute values, factoring, and roots). Various symbolic forms are addressed including rectangular, polar, and exponential as well as the various operations which can be done in each form. There is an emphasis on using Argand Diagrams to geometrically represent complex numbers in different forms and the operations. There are many different videos and activities which address a very specific aspect as well as those which address changing between forms of complex numbers. Euler's formula is NOT directly addressed.

### **A Visual, Intuitive Guide to Imaginary Numbers**

(<http://betterexplained.com/articles/a-visual-intuitive-guide-to-imaginary-numbers/>)

This is a website with detailed explanations of the geometry of complex numbers. There are not any activities, but the explanations are fun, easy to follow, and use many visuals. The emphasis is on viewing complex numbers as rotations.

### **Intuitive Arithmetic with Complex Numbers**

(<http://betterexplained.com/articles/intuitive-arithmetic-with-complex-numbers/>)

This website gives detailed explanations with a focus on geometry of operations done with complex numbers such as magnitude, addition, subtraction, multiplication, division, and complex conjugates.

### **Intuitive Understanding of Euler's Formula**

(<http://betterexplained.com/articles/intuitive-understanding-of-eulers-formula/>)

This website gives a very detailed explanation and has a corresponding video detailing the geometry of Euler's formula. There are, additionally, worked out examples which use Euler's formula with explanations of the meaning.

### **Hyperphysics**

(<http://hyperphysics.phy-astr.gsu.edu/hbase/cmplx.html>)

This provides a very brief reminder of the algebra associated with complex numbers including the rectangular and exponential forms and expressing sines and cosines in terms of complex exponentials. Note that the authors use "j" instead of "i" as their convention for an imaginary number. There are links to applications of complex numbers in physics such as plane wave expressions.

### **Interactive Mathematics**

(<http://www.intmath.com/complex-numbers/imaginary-numbers-intro.php>)

This website covers various forms and representations of complex numbers as well as operations of adding, subtracting, multiplying, and dividing. There are some basic problems with answers which can be used as practice (the solutions aren't showing until the link is clicked). Additionally, there are examples of applications using AC circuits. Note that the authors use "j" instead of "i" as their convention for an imaginary number as well as the use of degrees rather than radians for angles.