Remote Lesson 4.6 OPTIONAL

Powers of Complex Numbers

In lesson 4.5, we worked with imaginary and complex numbers.

Consider the process involved in expanding Not a difficult task. We would, rather quickly, arrive at a solution of . However, if we were to take that same binomial and raise it to a different power, say we may not be as enthusiastic about finding a solution.

One reason for learning the different forms in which a number can be written is that there may be an easier way to accomplish tasks like .

Geometric Multiplication

Given complex numbers, x and w, and

Example:

So in polar form, multiplication is fairly simple.

Example:

Using geometric multiplication, we again quickly arrive at an answer, namely If we look at this problem a little more closely, it may provide some insight into to how to tackle .

So using geometric multiplication we laid out the coordinate four times and multiplied the number 2 four times. In short . We then added four times. In short, 4().

So

DeMoivre’s Theorem

Given a complex number

So now if we go back to trying to expand , our first thought should be changing to polar form where it will be easier to raise it to the eighth power.

Changing (1,1) to polar form: .

So

Now,

The hard work of raising the number to the 8th power is now done. The only thing left to consider is that this question was asked in complex, or form so we simply have to change it back. If we use trig form for this number and evaluate it, we will be finished.

Trig form:

Answer: .

Most of the work here was done in converting numbers to another form; however, this is still significantly less work than using what we would call traditional methods.

Google “DeMoivre’s Thm practice worksheets” to find extra practice!