Imaginary Numbers Homework – Homework: Imaginary Numbers*

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Abstract

This module provides practice problems related to i and imaginary numbers.

We began our in-class assignment by talking about why $x^3 = --1$**does** have a solution, whereas $x^2 = --1$ does **not**. Let's talk about the same thing **graphically**.

Exercise 1

On the graph below, do a quick sketch of $y = x^3$.

ppp

a. Draw, on your graph, all the points on the curve where $y = 1$. How many are there?
b. Draw, on your graph, all the points on the curve where $y = 0$. How many are there?
c. Draw, on your graph, all the points on the curve where $y = --1$. How many are there?

Exercise 2

On the graph below, do a quick sketch of $y = x^2$.

ppp

a. Draw, on your graph, all the points on the curve where $y = 1$. How many are there?
b. Draw, on your graph, all the points on the curve where $y = 0$. How many are there?
c. Draw, on your graph, all the points on the curve where $y = -1$. How many are there?

Exercise 3

Based on your sketch in exercise #2...

a. If a is some number such that $a > 0$, how many solutions are there to the equation $x^2 = a$?
b. If a is some number such that $a = 0$, how many solutions are there to the equation $x^2 = a$?
c. If a is some number such that $a < 0$, how many solutions are there to the equation $x^2 = a$?
d. If i is defined by the equation $i^2 = --1$, where the heck is it on the graph?

OK, let's get a bit more practice with i.

Exercise 4

In class, we made a table of powers of i, and found that there was a repeating pattern. Make that table again quickly below, to see the pattern.

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i^1	
i^2	
i^3	
i^4	
i^5	
i^6	
i^7	
i^8	
i^9	
i^{10}	
i^{11}	
i^{12}	

Table 1

Exercise 5
Now let's walk that table **backward**. Assuming the pattern keeps up as you back up, fill in the following table. (Start at the bottom.)

i^{-4}	
i^{-3}	
i^{-2}	
i^{-1}	
i^0	

Table 2

Exercise 6
Did it work? Let's figure it out. What should i^0 be, according to our general rules of exponents?

Exercise 7
What should i^{--1} be, according to our general rules of exponents? Can you simplify it to look like the answer in your table?

Exercise 8
What should i^{--2} be, according to our general rules of exponents? Can you simplify it to look like the answer in your table?

Exercise 9
What should i^{--3} be, according to our general rules of exponents? Can you simplify it to look like the answer in your table?

Exercise 10
Simplify the fraction $\frac{i}{4-3i}$.