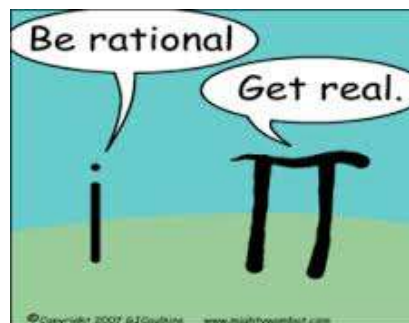


Complex Numbers

- Complex Numbers
- Operations with Complex Numbers
- Complex Conjugates and Division
- Complex Solutions of Quadratic Equations

~The zeros of polynomials are complex numbers



Sections P6:

HW: Pg 52 #'s 1, 4, 5, 9, 11, 17, 20, 30, 35, 41, 43

Aug 20-7:12 AM

$$3) \quad \underline{4x^2} - \underline{8x} + \underline{3} = 0$$

$$(4)(3) = 12$$

$\underline{4x^2}$	$-2x$	$(2x(2x-1) - 3(2x-1))$
$-6x$	$\underline{3}$	

1	12
2	6
3	4

$$3(-2x+1) - 3(\underline{2x-1})$$

$$(2x-1)(2x-3) = 0$$

Aug 28-11:13 AM

$$6) \quad x(3x+11) = 20$$

$$3x^2 + 11x = 20$$

$$3x^2 + \underline{11x} - 20 = 0$$

<u>$3x^2$</u>	$15x$	$3x(x+5)$
$-4x$	<u>-20</u>	$-4(x+5)$

$$(x+5)(3x-4)$$

$$(3)(-20) = -60$$

/ \	
1	60
2	30
3	20
4	15
-4	+15

Aug 28-11:20 AM

$$12) \quad (2x+3)^2 = 169$$

$$2x+3 = \pm 13$$

$$\begin{array}{r} 2x+3 = 13 \\ -3 \quad -3 \\ \hline \end{array}$$

$$2x = 10$$

$$x = 5$$

$$\begin{array}{r} 2x+3 = -13 \\ -3 \quad -3 \\ \hline \end{array}$$

$$2x = -16$$

$$x = -8$$

Aug 28-11:28 AM

Calvin and Hobbes by Bill Watterson

HERE'S ANOTHER MATH PROBLEM I CAN'T FIGURE OUT. WHAT'S $9+4$?

OOH, THAT'S A TRICKY ONE. YOU HAVE TO USE CALCULUS AND IMAGINARY NUMBERS FOR THIS.

IMAGINARY NUMBERS?

YOU KNOW, ELEVENTEEN, THIRTY-TWO AND ALL THOSE. IT'S A LITTLE CONFUSING AT FIRST.

HOW DID YOU LEARN ALL THIS? YOU'VE NEVER EVEN GONE TO SCHOOL!

INSTINCT. TIGERS ARE BORN WITH IT.

Complex Numbers

$a + bi$

Real Part Imaginary Part

$\sqrt{-1}$ $\sqrt{-1} = i$

↑ ↑
real imaginary

Aug 20-11:53 AM

Adding and Subtracting Complex Numbers

Perform the indicated operation.

$$\begin{array}{rcl} a + bi & a + bi & \text{Real} \pm \text{Real} \\ (7 - 3i) + (4 + 5i) & & \text{Imag} \pm \text{Imag} \end{array}$$

$$7 + 4 - 3i + 5i$$

$$11 + 2i$$

$$(2 - i) - (8 - 3i)$$

$$-8 + 3i$$

$$2 - 8 - i + 3i$$

$$-6 + 2i$$

Aug 20-8:43 AM

Multiplying Complex Numbers

Find the product

$$(3 + 2i)(4 - 3i)$$

$$(3)(4) + (3)(-3i) + (2i)(4) + (2i)(-3i)$$

$$\underline{12} - 9i + 8i - 6i^2 \quad i^2 = -1$$

$$-6(-1) \\ \underline{+6}$$

$$18 - i$$

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Dividing Complex Numbers

Write the complex number in standard form

$$a + bi$$

$$\frac{2}{3-i} \frac{(3+i)}{(3+i)} = \frac{6+2i}{9-\boxed{i^2}}$$

1st term squared
- last term squared

$$= \frac{6+2i}{10}$$

$$\frac{5+i}{2-3i} \frac{(2+3i)}{(2+3i)} = \frac{3}{5} + \frac{1}{5}i$$

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Nature of the Solutions

Value of the discriminant	Type and number of Solutions	Example of graph
Positive Discriminant $b^2 - 4ac > 0$	Two Real Solutions If the discriminant is a perfect square the roots are rational. Otherwise, they are irrational.	
Discriminant is Zero $b^2 - 4ac = 0$	One Real Solution	
Negative Discriminant $b^2 - 4ac < 0$	No Real Solutions Two Imaginary Solutions	

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Determining the Number and Types of Solutions

Using the discriminant, determine the nature of the solutions to the quadratic.

$2x^2 + 3x - 1$ A B C	$3^2 - 4(2)(-1)$ $9 - -8$ 17	2 real soln
$3x^2 + 2x + 2$	$2^2 - 4(3)(2)$ $4 - 24$ -20	no real soln imag.
$x^2 + 4x + 4$	$4^2 - 4(1)(4)$ $16 - 16$ 0	1 real soln repeated

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Solving a Quadratic Equation

Solve

$$A=1$$

$$B=-1$$

$$C=1$$

$$x^2 + x + 1 = 0$$

$$b^2 - 4ac$$

$$1^2 - 4(1)(1)$$

$$1 - 4$$

$$-3$$

no real soln

$$\frac{-1 \pm \sqrt{-3}}{2(1)}$$

$$\frac{-1 \pm \sqrt{3}i}{2}$$

$$-\frac{1}{2} + \frac{\sqrt{3}}{2}i$$

$$-\frac{1}{2} - \frac{\sqrt{3}}{2}i$$

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