# Office hours – Mon Oct. 18

**Example** (WebWork, "Complex Numbers" #7)

(division of complex #s)

(note: Friday in class we covered multiplication of complex #s ... just use "FOIL"

$i^2 = -1$

$i = \sqrt{-1}$

Ex: $(2+2i)\cdot(-7-6i)$

$a+bi$

$= -14 - 12i - 14i + (2i)(-6i)$

$= -14 - 26i - 12i^2$ $\quad +12$

$= -2 - 26i$

$-12i^2$

$= -12(-1)$

$= 12$

Tomorrow in class:

$$\frac{(-1-i)}{(-7-4i)} \cdot \frac{(-7+4i)}{(-7+4i)}$$

strategy: multiply by a "special form of 1"

"complex conjugate"

$-7+4i$

(you have done this w/ real # ratios...

$$\left(\frac{1}{2}\cdot\frac{3}{3}\right)+\left(\frac{1}{3}\cdot\frac{2}{2}\right)$$

$$= \frac{3}{6}+\frac{2}{6} = \frac{3+2}{6} = \frac{5}{6}$$

Why??

# Class #21 – Tues Oct. 19

Today: a+bi

- finish complex numbers ("ComplexNumbers WW.")
  - (last time: addition/subtraction (#3,4)
    multiplication. (#5,6)
  - today: division (#7,8).

§8.8 (open store)

- "QuadraticFormula" question? — due tonight
- Graphs of quadratic polynomials (parabolas).

# Ex: (Complex Numbers, #7)

Simplify this ratio of complex #s:

$$\frac{\frac{-1-i}{-7-4i}}{\frac{-7+4i}{-7+4i}}$$

★ $i^2 = -1$

$$= \frac{7 - 4i + 7i - 4i^2}{49 - 28i + 28i - 16i^2}$$

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

$$= \frac{7 + 3i + 4}{49 + 16} = \frac{11 + 3i}{65}$$

$$= \frac{11}{65} + \frac{3i}{65} = \frac{11}{65} + \frac{3}{65}i$$

Ex : Simplify :

$$\frac{(1+9i)}{(-4+7i)} \cdot \frac{(-4-7i)}{(-4-7i)} = \ldots\ldots$$

(See §8.8 : "Product of Complex Conjugates"

Examples 8.86

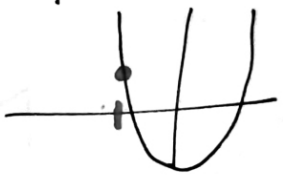
Try It 8.171

## ⑧ "Quadratic Formula" #2 + #3

List "the roots of the parabola" (i.e., list the solutions of the quadratic equation)

$$y = x^2 - 18x + 85$$

graph – "parabola"



$$\{ x^2 - 18x + 85 = 0$$

use the quad. form!

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{18 \pm \sqrt{(-18)^2 - 4(1)(85)}}{2(1)}$$

$$\{ b^2 - 4ac = 324 - 340 = -16$$

$$= \frac{18 \pm \sqrt{-16}}{2}$$

$$\sqrt{-16} = \sqrt{(16)(-1)} = 4i$$

$$= \frac{18 \pm 4i}{2} = \boxed{9 \pm 2i}$$

# Simpler quadratic formula example:

Solve: $x^2 - 6x = 3$ (using quadratic formula!)

(1) Make the RHS = 0

$1x^2 - 6x - 3 = 0$

(2) Apply the QF:

$$x = \frac{6 \pm \sqrt{36 - 4(-3)}}{2}$$

$$= \frac{6 \pm \sqrt{48}}{2}$$ ✓

$$= \frac{6 \pm 4\sqrt{3}}{2} = \boxed{3 \pm 2\sqrt{3}}$$

$\sqrt{48}$

16 · 3

$= \sqrt{16(3)}$

$= \sqrt{16} \cdot \sqrt{3}$

$= 4\sqrt{3}$