Warm-Up:

Consider the system of equations below. Find the solution.

$y = x^2 + 4x - 3$

$y = 2x - 6$

$2x - 6 = x^2 + 4x - 3$

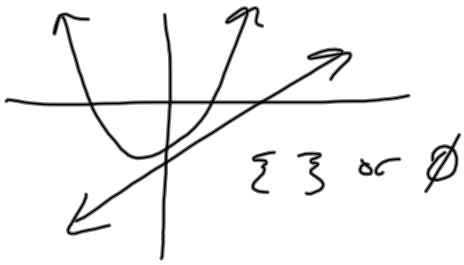
$x^2 + 2x + 3 = 0$

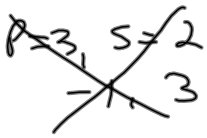
$x^2 + 2x + 1 = -3 + 1$

$(x+1)^2 = \pm\sqrt{-2}$

$x + 1 = \pm i\sqrt{2}$

$x = \{-1 \pm i\sqrt{2}\}$





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4-2 HW Answer Key

Mini quiz today on Day 1

1. 3 + 5i
2. Yes, real numbers can be written as a + bi where b = 0. (Ex. 3 + 0i)
3. 24
4. -12
5. $6i\sqrt{3}$
6. 20 - i
7. 13 - 9i
8. -5 + 31i
9. 3 - 3i
10. 22 + 14i
11. 16 - 38i
12. 3 - 2i, -4 + 6i, x + 5i
13. $x^2 + 49$
14. 34

See attached for graph key

Oct 2-2:07 PM

Name Key

Alg 2 Homework 4-2

1. Give an example of a complex number. $3+5i$

2. Are real numbers complex? Yes

Explain. Real #'s can be written as a+bi where b=0.
Ex. $3 = 3+0i$

Simplify:

3. $(2\sqrt{6})^2 = 4(6) = 24$

2 · 9 · 6
9 · 12
9 · 4 · 3

1	108
2	54
3	36

4. $(\sqrt{-6})(\sqrt{-24}) = i\sqrt{6} \cdot i\sqrt{24} = i^2\sqrt{144} = -1(12) = -12$

5. $(\sqrt{6})(\sqrt{-18}) = \sqrt{6} \cdot i\sqrt{18} = i\sqrt{108} = i\sqrt{36}\sqrt{3} = 6i\sqrt{3}$

Add, subtract or multiply the following complex numbers.

6. $(13 + 4i) + (7 - 5i) = 20 - i$

7. $(8 - 6i) + (5 - 3i) = 13 - 9i$

8. $(3 + 11i) - (8 - 20i) = -5 + 31i$

9. $(8 - 6i) - (5 - 3i) = 3 - 3i$

10. $(2 + 4i)(5 - 3i) = 10 - 6i + 20i - 12i^2$
$= 10 + 14i + 12$
$= 22 + 14i$

11. $(7 - i)(3 - 5i) = 21 - 35i - 3i + 5i^2$
$= 21 - 38i - 5$
$= 16 - 38i$

(Continued on back→)

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12. What are the conjugates of:

$(3 + 2i)$? $3 - 2i$ $(4 - 6i)$? $-4 + 6i$ $(x - 5i)$? $x + 5i$

Multiply the following complex numbers with its conjugate:

13. $(x + 7i)(x - 7i) = x^2 - 7xi + 7xi - 49i^2$
$= x^2 + 49$

$\sqrt{x^2+49} \neq x+7$

$(x+7)^2 = x^2+49$
$(x+7)(x+7)$
$x^2 + 14x + 49$

14. $(3 + 5i)(3 - 5i) = 9 - 15i + 15i - 25i^2$
$= 9 + 25$
$= 34$

Express the quantities below in a + bi form, then graph and label the corresponding points on the complex plane.

1. $(-3 + 2i) + (-3 - 2i) = -6 + 0i$

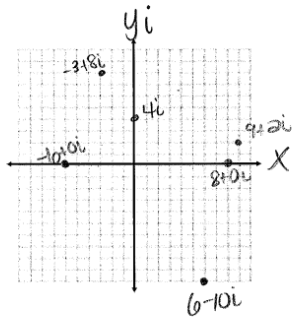
2. $(3 + 2i) - (3 - 2i) = 4i$

3. $(4 + 5i) - (7 - 3i) = -3 + 8i$

4. $(4 + 5i) + (5 - 3i) = 9 + 2i$

5. $(2 + 2i)(2 - 2i) = 4 - 4i + 4i - 4i^2$
$= 4 + 4$
$= 8 + 0i$

6. $(-4 + i)(-2 + 2i) = 8 - 8i - 2i + 2i^2$
$= 8 - 10i - 2$
$= 6 - 10i$



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Powers of i and more operations with complex numbers

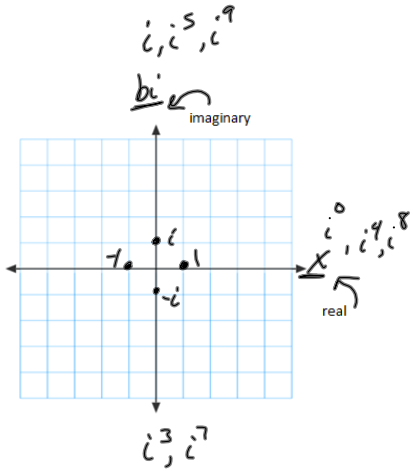
$i = \sqrt{-1}$

Since $i^2 = -1$ we can see that:

$i^3 = i^2 \cdot i^1 = -1 \cdot i = -i$

$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$

Plot i, i^2, i^3 and i^4 on the complex plane to the r



Simplify the following:

$i^5 = i^4 \cdot i^1 = 1 \cdot i = i$

$i^6 = i^4 \cdot i^2 = 1 \cdot -1 = -1$

$i^7 = i^4 \cdot i^3 = 1 \cdot -i = -i$

$i^8 = i^4 \cdot i^4 = 1 \cdot 1 = 1$

$i^9 = i^8 \cdot i^1 = 1 \cdot i = i$

$i^0 = 1$

Powers of i

$i^0 = 1$
$i^1 = i$
$i^2 = -1$
$i^3 = -i$
$i^4 = 1$

Simplify i^{102}

$i^4 = 1 = i^8 = i^{12} = i^{16} = i^{20}$

$i^{101} = i^{100} \cdot i^1 = 1 \cdot i = i$

$i^{102} = i^{100} \cdot i^2 = 1 \cdot -1 = -1$

$i^{103} = i^{100} \cdot i^3 = 1 \cdot -i = -i$

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Simplify the following:

1. $i^{26} = i^{24} \cdot i^2 = 1 \cdot -1 = -1$

2. $i^{43} = i^{40} \cdot i^3 = 1 \cdot -i = -i$

3. $i^{00} = 1$

4. $i^{421} = i^{420} \cdot i^1 = 1 \cdot i = i$

5. $(i^6)(i^7) = i^{13} = i^{12} \cdot i = 1 \cdot i = i$

6. $3i^2 - 6i^{12} = 3(-1) - 6(1) = -3 - 6 = -9$

More practice simplifying.

7. $\sqrt{-4} - \sqrt{-100} = -8i$

8. $2\sqrt{-25} - 3\sqrt{-49} = 2i\sqrt{25} - 3i\sqrt{49} = 10i - 21i = -11i$

9. $2\sqrt{-50} + \sqrt{-32} = 2i\sqrt{50} + i\sqrt{32} = 2i\sqrt{25}\sqrt{2} + i\sqrt{16}\sqrt{2} = 10i\sqrt{2} + 4i\sqrt{2} = 14i\sqrt{2}$

10. $\sqrt{-81} \cdot \sqrt{-25} = 9i \cdot 5i = 45i^2 = 45(-1) = -45$

11. $\sqrt{-5} \cdot \sqrt{-80} = i\sqrt{5} \cdot i\sqrt{16}\sqrt{5} = i\sqrt{5} \cdot 4i\sqrt{5} = 4i^2\sqrt{25} = 4(-1)(5) = -20$

12. $-3\sqrt{-10} \cdot \sqrt{-10} = 30$

4, 8
4 · 4 2

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Express each of the following in a + bi form.

13. $(2 + 5i) + (4 + 3i) =$ $6+8i$

15. $(4 + i) + (2 - i) - (1 - i) =$ $5+i$

14. $(-1 + 2i) - (4 - 3i) =$

$=-1+2i-4+3i$

$=-5+5i$

mult. 16. $(5 + 3i)(5 - 3i) =$ $25+15i-15i-9i^2$

$=25-9(-1)$

$=25+9=34$

Find the real values of x and y using the fact that if $a + bi = c + di$, then $a = c$ and $bi = di$.

17. $5x + 3yi = 20 + 9i$

$5x=20$ | $3yi=9i$

$x=4$ | $y=3$

18. $-4 + yi = -12x - i + 8$

$-4+yi=8-12x-i$

$-4=8-12x$ | $yi=-i$

$-12=-12x$ | $y=-1$

$x=1$

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