

Name \_\_\_\_\_

Date \_\_\_\_\_

Advanced Algebra

Unit 4: Quadratics

Assignment Classwork #16

LT: I can work with the complex number system

The following notes are important:

$$i^2 = -1 \text{ so } i = \sqrt{-1}$$

Use your calculator and the fact that  $i^2 = -1$  to simplify the following square roots.

|                    |                    |                    |
|--------------------|--------------------|--------------------|
| 1) $\sqrt{-81} =$  | 2) $\sqrt{-289} =$ | 3) $\sqrt{-225} =$ |
| 4) $\sqrt{-342} =$ | 5) $\sqrt{-650} =$ | 6) $\sqrt{-196} =$ |
| 7) $\sqrt{-408} =$ | 8) $\sqrt{-256} =$ | 9) $\sqrt{-19} =$  |

LT: I can use the box method or FOIL to multiply out expressions involving "i"

Multiply the following expressions out. You can set up a box to help you.

1)  $(2+3i)(2-3i)$

|       |       |         |
|-------|-------|---------|
|       | 2     | $3i$    |
| 2     | 4     | $6i$    |
| $-3i$ | $-6i$ | $-9i^2$ |

$4 + 9$

$13$

2)  $(3-5i)(3+5i)$

$9 + 25$

$34$

3)  $(4-6i)(4+6i)$

$4^2 + 6^2$

$16 + 36$

$52$

|      |       |          |
|------|-------|----------|
|      | 4     | $-6i$    |
| 4    | 16    | $-24i$   |
| $6i$ | $24i$ | $-36i^2$ |

$16 - 36i^2$

$16 - 36(-1)$

$16 + 36$

$52$

4)  $5(3-2i)(3+2i)$

$5(9 - 4i^2)$

$5(9 + 4)$

$5 \cdot 13$

$65$

5)  $3(6-7i)(6+7i)$

$3(36 - 49i^2)$

$255$

6)  $10(12-4i)(12+4i)$

$10(144 + 16)$

$10(160)$

$1600$

LT: I can find the quadratic given the imaginary roots:

Given a quadratic in the form  $x^2 + bx + c$

$-b$  = the sum of the roots

$C$  = the product of the roots

Find the quadratic equation with  $(a=1)$  given the following roots

1)  $(6+2i)(6-2i)$

a) OK, so what are the sum of the roots? This means simply use your "combine like terms skills" you have from intermediate algebra. You are simply adding  $6+2i + 6 - 2i$ . This gives us 12. This is no different than saying simplify the expression  $8+x+2-x$ . We should all have had experience combining like terms before.

Now we know that  $-b = 12$  so therefore  $b = -12$

b) If I want to know the product of a binomial, we have worked on using the box method to multiply. So we could set this up in a 2by2 box.

|     |      |                  |
|-----|------|------------------|
|     | 6    | 2i               |
| 6   | 36   | 12i              |
| -2i | -12i | -4i <sup>2</sup> |

→

We can always combine like  
Terms on a diagonal in the box  
So  $12i + -12i = 0$   
The middle terms drops out

So my box give me  $36+4$  which is equal to 40.

Great! I now know the product of the Roots. This is awesome. I can now write my equation.

My final equation is  $y = x^2 - 12x + 40$

You can always check this equation with the quadratic formula and see if you get the roots of  $(6+2i)$  and  $(6-2i)$ . Check this now.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Yea!! It all works. Now you will try to write the equation of a parabola in the form  $y=x^2+bx+c$   
 So you know this important note.

Given a quadratic in the form  $x^2 + bx + c$   
 $-b =$  the sum of the roots  
 $c =$  the product of the roots

Write the equation of the parabola given the imaginary roots. Remember to use the important note above in the box and your background knowledge of how to combine like terms and your ability to multiply or FOIL using the box method. All of your answers should look similar to the example problem.

|   |  |  |
|---|--|--|
| <p>2) <math>(4-2i)(4+2i)</math><br/>                     Sum = 8<br/> <math>c = 16+4 = 20</math><br/> <math>-b = 8 \quad b = -8</math><br/> <math>y = x^2 - 8x + 20</math></p>          | <p>3) <math>(3+2i)(3-2i)</math><br/>                     Sum = 6<br/> <math>c = 9+4 = 13</math><br/> <math>-b = 6 \quad b = -6</math><br/> <math>y = x^2 - 6x + 13</math></p>      | <p>4) <math>(3+3i)(3-3i)</math><br/>                     Sum = 6<br/> <math>c = 9+9 = 18</math><br/> <math>-b = 6 \quad b = -6</math><br/> <math>y = x^2 - 6x + 18</math></p>                  |
| <p>5) <math>(5+3i)(5-3i)</math><br/>                     Sum = 10<br/> <math>c = 25+9 = 34</math><br/> <math>-b = 10 \quad b = -10</math><br/> <math>y = x^2 - 10x + 34</math></p>      | <p>6) <math>(5+2i)(5-2i)</math><br/>                     Sum = 10<br/> <math>c = 25+4 = 29</math><br/> <math>-b = 10 \quad b = -10</math><br/> <math>y = x^2 - 10x + 29</math></p> | <p>7) <math>(9+3i)(9-3i)</math><br/>                     Sum = 18<br/> <math>c = 9^2 + 9 = 81 + 9 = 90</math><br/> <math>-b = 18 \quad b = -18</math><br/> <math>y = x^2 - 18x + 90</math></p> |
| <p>8) <math>(10+2i)(10-2i)</math><br/>                     Sum = 20<br/> <math>c = 100+4 = 104</math><br/> <math>-b = 20 \quad b = -20</math><br/> <math>y = x^2 - 20x + 104</math></p> | <p>9) <math>(6+4i)(6-4i)</math><br/>                     Sum = 12<br/> <math>c = 36+4 = 40</math><br/> <math>y = x^2 - 12x + 40</math></p>   | <p>10) <math>(12+3i)(12-3i)</math><br/>                     Sum = 24<br/> <math>c = 144+9 = 153</math><br/> <math>-b = 24 \quad b = -24</math><br/> <math>y = x^2 - 24x + 153</math></p>       |