Math 3 **Name** _____

Unit 3, Lesson 3: Irrational and Imaginary Roots of Polynomials

An irrational root of a polynomial is one that contains a square root.

- Examples: $2+\sqrt{5}$, $\sqrt{13}$, $3-\sqrt{11}$)

Irrational roots ALWAYS travel in pairs:

If $2+\sqrt{5}$ is a root then its conjugate _____ is also a root.

What would be the conjugate of $\sqrt{13}$? _____

What about $3-\sqrt{11}$? _____

An imaginary root is one that contains an imaginary number (i).

- Examples: (3+ 2i ,−7i ,9 −14i)

Imaginary roots ALWAYS travel in pairs:

If 3 + 2i is a root then its conjugate _____ is also a root.

What is the conjugate of −7i? _____

Examples:

1. A polynomial has the roots $4-\sqrt{7}$ and $\sqrt{5}$. Name two additional roots.

2. A polynomial has the roots $3i$ and $-2+i$. Name two additional roots.

You Try:

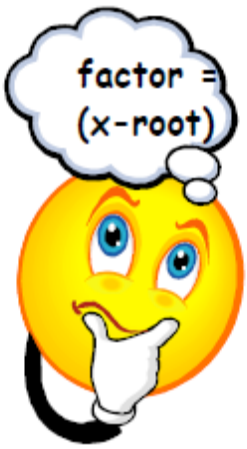
3. A polynomial has the roots $2+3i$ and $\sqrt{7}$. Name two additional roots.

4. A polynomial has the roots $-4i$ and $6-i$. Name two additional roots.

<u>Writing a Polynomial from its Roots</u>

Find a third degree equation that has roots at:

5. 3 and $2i$
   a. List all roots: _____
   b. Write equation using the above roots:



6. -4 and $4i$
    a. List all roots: _____
    b. Write equation using the above roots:

7. -7 and $\sqrt{2}$
    a. List all roots: _____
    b. Write equation using the above roots:

8. 3 and $2-i$
    a. List all roots: _____
    b. Write equation using the above roots:

9. 6 and $2-\sqrt{3}$
    a. List all roots: _____
    b. Write equation using the above roots:

Lesson 3 Practice

Write a 3rd degree polynomial equation with the given roots. Show work on a separate sheet.

No work=No credit.

1. $1, 2 - i$

2. $5 + 2i, -2$

3. $3, 6 + i$

4. $-4, \sqrt{2}$

5. $2 - \sqrt{3}, -1$

6. $0, 3 - \sqrt{3}$

7. $3i, 7$

8. $2 + \sqrt{5}, 3$

9. $-3, i$

10. $1 - i, 8$

11. $1, 5i$

12. $2, 4 + i$

13. $3, -4i$

14. $0, 2 - i$

15. $-7, 1 - \sqrt{2}$

16. $-4, -\sqrt{7}$