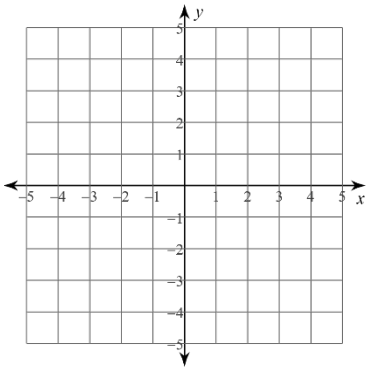
Name: _____ Date: _____ Period: _____

Imaginary Numbers Practice

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

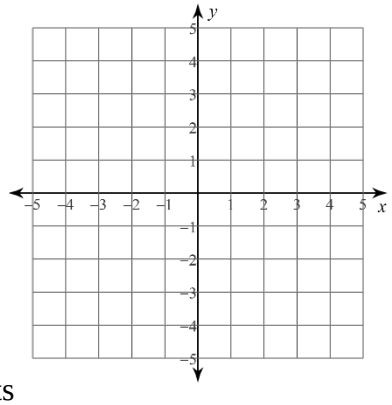
1. Solve:
   a. $x^2 + 1 = 0$ b. $x^2 - 4 = 0$ c. $x^2 + 2 = 0$

2. Practice multiplying this polynomial out into Standard form:
   $f(x) = (x + 2i)(x - 2i)(x + 3)$



3. What if you're given a complex number as a factor?

   Example: $f(x) = x^3 + 7x^2 + 25x + 175$ and a factor is $(x - 5i)$.



For problems 3-5, write down the possible combinations of real and complex roots the polynomial can have.

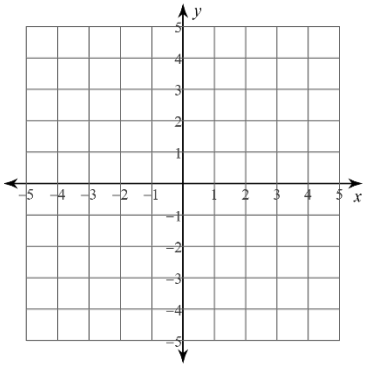
4. $f(x) = x^4$

5. $f(x) = x^3$

6. $f(x) = x$

Find all of the factors.

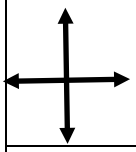
7. $f(x) = x^3 - 6x^2 + 9x - 54$, a factor is $(x - 3i)$



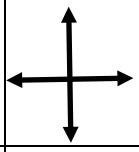
Dividing Polynomials with Complex Roots

Instructions: For each problem, one factor of a cubic function is given. Find the remaining factors and use this information to determine all the roots of the function and sketch a graph.

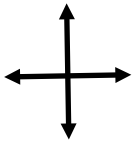
8. $f(x) = x^3 + 3x^2 - 4x - 12, factor\ (x + 3)$



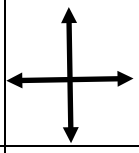
9. $f(x) = x^3 + 6x^2 + 11x + 6, factor\ (x + 1)$



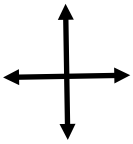
10. $f(x) = x^3 - 4x^2 + 9x - 36, factor\ (x - 3i)$



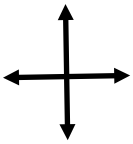
11. $f(x) = x^3 + 2x^2 + 5x + 10, factor\ (x + 2)$



12. $f(x) = 3x^3 + x^2 + 108x - 36, factor\ (x + 6i)$



13. $f(x) = 2x^3 - 3x^2 + 4x - 6, factor\ (2x - 3)$



Instructions: Given the roots, find the factors and write the polynomial equation in standard form.

14. 9. Roots: $3, -4, 0$

15. Roots: $5, 2i, -2i$

16. Roots: $\sqrt{3}, -\sqrt{3}, -2$

17. Roots: $1, -1, -3$