

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Unit 6 Class Work

**Polynomials with Imaginary Roots Class Work**

✍ **Objective:** *You will be able to rewrite polynomials with imaginary roots.*

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**Review Do-Now**

Determine the roots, as well as their multiplicities of each function:

$$f(q) = q^4 - 8q^2 + 16.$$

$$p(w) = 4w + 16w^3 + 16w^5$$

**Polynomials with Imaginary Roots Class Work**

✔ **Objective:** *You will be able to rewrite polynomials with imaginary roots.*

**Task A:**

Which equation has imaginary factors, and why?

$x^2 - 18 = 18$

$x^2 + 18 = -18$   
 $x^2 = -36$        $\sqrt{x^2} = \sqrt{36}$   
 $x = \pm 6i$

$x^2 + 64 = -16x$   
 $x^2 - 16x + 64 = (x-8)(x-8)$

$x^2 - 80 = -16x$

**Task B:** Which equation has  $i$  as a root, and why?

$x^2 + 1 = 2x^2$

$4x^2 + 1 = 3x^2$   
 $x^2 = -1$   
 $x = \pm i$

$x^2 - 1 = -2x^2$

**EXPRESSIONS WITH IMAGINARY ROOTS:**

**Goal 1:**

Rewrite each expression as a single binomial.

a.  $(3x - 2i)(3x + 2i)$

$9x^2 + 6xi - 6xi - 4i^2$   
 $9x^2 + 4$

sums of perfect squares

b.  $2y(y - 3i)(y + 3i)$

$2y(y^2 + 3yi - 3yi - 9i^2)$   
 $2y(y^2 + 9)$   
 $2y^3 + 18y$

$-9i^2$   
 $-9(-1)$   
 $9$

c.  $(5k + 4i)(5k - 4i)$

$25k^2 - 20ki + 20ki - 16i^2$   
 $25k^2 - 16(-1)$   
 $25k^2 + 16$

d.  $3(11 + 12i)(11 - 12i)$

**Goal 2:** State any relationships you noticed or observations you can make about the types of problems in a, b, c, and d.

$$x^2 + 50x^2 + 288$$

GCF

$$2(25x^2 + 144)$$

SUM  
OF  
SQUARES

$$2(5x + 12i)(5x - 12i)$$

Check

$$2(25x^2 - 144i^2)$$

$$2(25x^2 - 144(-1))$$

$$2(25x^2 + 144)$$

**Goal 3:** Work Backwards! Express each binomial as a sum of two or three factors.

a.  $9r^2 + 169$   
 $3r + 13i$   
 $(3r - 13i)(3r + 13i)$

b.  $8m^2 + 200$   
 $8(m^2 + 25)$   
 $8(m + 5i)(m - 5i)$

c.  $400b^2 + 9$   
 $(20b + 3i)$   
 $(20b - 3i)$

d.  $3x^3 + 48x$   
 $3x(x^2 + 16)$   
 $3x(x + 4i)(x - 4i)$

**Goal 4:** Compare and contrast “difference of two squares,” and “sum of two squares” expressions. How are they alike; how are they different? You may choose to create examples to support your claims! 😊

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Homework: Factor each expression.

1.  $4d^2 + 81$

2.  $3x^2 + 147$

3.  $36n^3 + 16n$

4.  $196f^4 + 121$

Solutions:

1.  $(2d + 9i)(2d - 9i)$

2.  $3(x + 7i)(x - 7i)$

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

4.  $(14f^2 + 11i)(14f^2 - 11i)$

\*Also remember to work on some Tenmarks! 😊