

LESSON #8: FACTORING THE SUM AND DIFFERENCE OF CUBES

Do-Now:

- a) $1^3 = 1$
 $2^3 = 8$
 $3^3 = 27$
 $4^3 = 64$
 $5^3 = 125$
 $6^3 = 216$
 $10^3 = 1000$
- b) $\sqrt[3]{27} = \boxed{3}$
- c) $\sqrt{64x^{12}} = \sqrt{64} \sqrt{x^{12}} = \boxed{8x^6}$
- d) $\sqrt[3]{64x^{12}} = \sqrt[3]{64} \sqrt[3]{x^{12}} = \boxed{4x^4}$
- e) $(4x^3)^2 = \boxed{16x^6}$

DIFFERENCE of Two Cubes: $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

1. Factor: $x^3 - 64$

$\sqrt[3]{x^3} = x$ $\sqrt[3]{64} = 4$ $(x-4)$

$(x-4)(x^2 + 4x + 16)$

2. Factor: $x^6 - 8$

$\sqrt[3]{x^6} = x^2$ $\sqrt[3]{8} = 2$ $(x-2)$

$(x-2)(x^2 + 2x + 4)$

"S. O. A. P"

SUM of Two Cubes: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

3. Factor: $x^3 + 125$

$\sqrt[3]{x^3} = x$ $\sqrt[3]{125} = 5$ $(x+5)$

$(x+5)(x^2 - 5x + 25)$

4. Factor: $8x^3 + 27$

$\sqrt[3]{8x^3} = 2x$ $\sqrt[3]{27} = 3$ $(2x+3)$

$(2x+3)(4x^2 - 6x + 9)$

Try on your own:

5. Factor: $c^3 - x^{12}$

$$\sqrt{c^3} = c \quad \left| (c - x^4)(c^2 + cx^4 + x^8) \right|$$
$$\sqrt{x^{12}} = x^4$$

6. Factor: $64x^{15} + 1$

$$\sqrt[3]{64x^{15}} = 4x^5$$

$$\sqrt[3]{1} = 1$$

$$\left| (4x^5 + 1)(16x^{10} - 4x^5 + 1) \right|$$

Factor completely:

7. Factor: $2x^3 - 250y^3$

$$2(x^3 - 125y^3)$$

$$\left| 2(x - 5y)(x^2 + 5xy + 25y^2) \right|$$

8. Factor completely: $x^5 - x^3 \left| \begin{array}{l} 8x^2 + 8 \\ -8(x^2 - 1) \end{array} \right.$

$$x^3(x^2 - 1) \left| \begin{array}{l} 8x^2 + 8 \\ -8(x^2 - 1) \end{array} \right.$$

$$(x^3 - 8)(x^2 - 1)$$

$$\left| (x - 2)(x^2 + 2x + 4)(x + 1)(x - 1) \right|$$

~~(x - 2)~~

Practice:

9. Factor: $24a^4 + 3ax^6$

$$3a(8a^3 + x^6)$$

$$\left| 3a(2a + x^2)(4a^2 + 2ax^2 + x^4) \right|$$

10. Factor completely: $x^7 + x^6m - 27x - 27m$

$$x^7 - 27x + x^6m - 27m$$

$$x(x^6 - 27) + m(x^6 - 27)$$

$$(x + m)(x^6 - 27)$$

$$\left| (x + m)(x^2 - 3)(x^4 + 3x^2 + 9) \right|$$

11. You decide: Difference of Two Squares or Difference of Two Cubes? Explain and

factor it.

b/c 8 is not divisible by 3

$$x^8 - 64$$

$$(x^4 + 8)(x^4 - 8)$$

$$\left| (x^4 + 8)(x^4 - 8) \right|$$