

AIM: HOW DO WE FACTOR THE SUM AND DIFFERENCE OF CUBES?

raise everything to the 2nd!

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) $\sqrt{64x^{12}} =$
 ↓
 divide by 2!
 $\sqrt{64} \sqrt{x^{12}}$
 $\boxed{8x^6}$

d) $\sqrt[3]{64x^{12}} =$
 ↓
 divide by 3!
 $\sqrt[3]{64} \sqrt[3]{x^{12}}$
 $\boxed{4x^4}$

e) $(4x^3)^2 =$
 $4^2 \cdot (x^3)^2$
 $\boxed{16x^6}$

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

1. Factor: $x^3 - 64$
 $'a' = \sqrt[3]{x^3} = x$
 $'b' = \sqrt[3]{64} = 4$
 $(x - 4)(x^2 + 4x + 16)$

2. Factor: $x^6 - 8$
 $'a' = \sqrt[3]{x^6} = x^2$
 $'b' = \sqrt[3]{8} = 2$
 $(x^2 - 2)(x^4 + 2x^2 + 4)$

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

3. Factor: $x^3 + 125$
 $'a' = \sqrt[3]{x^3} = x$
 $'b' = \sqrt[3]{125} = 5$
 $(x + 5)(x^2 - 5x + 25)$

4. Factor: $8x^3 + 27$
 $'a' = \sqrt[3]{8x^3} = 2x$
 $'b' = \sqrt[3]{27} = 3$
 $(2x + 3)(4x^2 - 6x + 9)$

"S. O. A. P"
 S: positive
 O: positive
 A: negative
 P: positive

used to help you remember the signs

PRACTICE- Factor completely:

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

$$\sqrt[3]{c^3} = c \quad (c - x^4)(c^2 + cx^4 + (x^4)^2)$$

$$\sqrt[3]{x^{12}} = x^4 \quad \boxed{(c - x^4)(c^2 + cx^4 + x^8)}$$

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

$$\sqrt[3]{64x^{15}} = 4x^5 \quad (4x^5 + 1)(4x^5)^2 + 4x^5 + 1^2$$

$$\sqrt[3]{1} = 1 \quad \boxed{(4x^5 + 1)(16x^{10} + 4x^5 + 1)}$$

7. Factor: $2x^3 - 250y^3$ **GCF FIRST!**

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

$$\boxed{2(x - 5y)(x^2 + 5xy + 25y^2)}$$

8. Factor: $x^5 - x^3 - 8x^2 + 8$

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

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

BOCS DOTS

$$\boxed{(x - 2)(x^2 + 2x + 4)(x + 1)(x - 1)}$$

9. Factor: $24a^4 + 3ax^6$ **GCF FIRST!**

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

$$\boxed{3a(2a + x^2)(4a^2 - 2ax^2 + x^4)}$$

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

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

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

$$\boxed{(x^3 - 3)(x^3 + 3x + 9)(x + m)}$$

WHAT STUCK WITH YOU?!

You decide: Difference of Two Squares or **Difference of Two Cubes?** Explain and factor it.

You would use DOTS
b/c x^8 is a perfect
square, not cube!

$$x^8 - 64$$

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