

Cube Factoring

Date:

The Sum and Difference of Cubes

$$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$$

$$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$$

**Proof:**

$$(x + y)^3 =$$

$$(x - y)^3 =$$

**Example 1**

Factor

a)  $x^3 - 8$

b)  $27y^3 + 64$

c)  $5u^3 - 40(x + y)^3$

d)  $x^9 - y^9$

## Cube Factoring

Date: \_\_\_\_\_

## 1. Factor

- |                |                 |                |                 |
|----------------|-----------------|----------------|-----------------|
| a) $a^3 - b^3$ | b) $a^3 + b^3$  | c) $c^3 + d^3$ | d) $x^3 - 8$    |
| e) $y^3 + 125$ | f) $z^3 - 1$    | g) $x^3 - a^3$ | h) $x^3 + 1$    |
| i) $x^3 - 343$ | j) $27 - y^3$   | k) $8x^3 - 1$  | l) $a^3b^3 - 1$ |
| m) $y^3 - 125$ | n) $64 - 27a^3$ | o) $27m^3 + 1$ | p) $64 + 27b^3$ |

## 2. Factor fully.

- |                 |                   |                        |
|-----------------|-------------------|------------------------|
| a) $5x^3 - 40$  | b) $2x^3 + 16y^3$ | c) $mc^3 + 1000m$      |
| d) $x^4 + x$    | e) $3y - 24y^4$   | f) $3a^4 - 81a$        |
| g) $y^6 + 8y^3$ | h) $54 - 2x^3$    | i) $x^3 - \frac{1}{8}$ |

## 3. Factor fully.

- |                            |                        |                          |
|----------------------------|------------------------|--------------------------|
| a) $(a+b)^3 - a^3$         | b) $(x-1)^3 + 1$       | c) $(x+3)^3 - 8$         |
| d) $(y+1)^3 + 1000$        | e) $(x+2)^3 - (x-2)^3$ | f) $(x+1)^3 - (y-2)^3$   |
| g) $(x-1)^3 + (x+1)^3$     | h) $(a+b)^3 - (a-b)^3$ | i) $(a+2b)^3 - (a-2b)^3$ |
| j) $(3x-2y)^3 + (2x-3y)^3$ | k) $x^6 - y^6$         | l) $x^9 + y^9$           |

**ANSWERS**

- $(a-b)(a^2 + ab + b^2)$ ,  $(a+b)(a^2 - ab + b^2)$ ,  $(c+d)(c^2 - cd + d^2)$ ,  $(x-2)(x^2 + 2x + 4)$ ,  
 $(y+5)(y^2 - 5y + 25)$ ,  $(z-1)(z^2 + z + 1)$ ,  $(x-a)(x^2 + ax + a^2)$ ,  $(x+1)(x^2 - x + 1)$ ,  
 $(x-7)(x^2 + 7x + 49)$ ,  $(3-y)(9 + 3y + y^2)$ ,  $(2x-1)(4x^2 + 2x + 1)$ ,  $(ab-1)(a^2b^2 + ab + 1)$ ,  
 $(y-5)(y^2 + 5y + 25)$ ,  $(4-3a)(16 + 12a + 9a^2)$ ,  $(3m+1)(9m^2 - 3m + 1)$ ,  $(4+3b)(16 - 12b + 9b^2)$
- $5(x-2)(x^2 + 2x + 4)$ ,  $2(x+2y)(x^2 - 2xy + 4y^2)$ ,  $m(c+10)(c^2 - 10c + 100)$ ,  
 $x(x+1)(x^2 - x + 1)$ ,  $3y(1-2y)(1+2y+4y^2)$ ,  $3a(a-3)(a^2 + 3a + 9)$ ,  $y^3(y+2)(y^2 - 2y + 4)$ ,  
 $2(3-x)(9+3x+x^2)$ ,  $\left(x - \frac{1}{2}\right)\left(x^2 + \frac{1}{2}x + \frac{1}{4}\right)$
- $b(3a^2 + 3ab + b^2)$ ,  $x(x^2 - 3x + 3)$ ,  $(x+1)(x^2 + 8x + 19)$ ,  $(y+11)(y^2 - 8y + 91)$ ,  
 $4(3x^2 + 4)$ ,  $(x-y+3)(x^2 + xy + y^2 - 3y + 3)$ ,  $2x(x^2 + 3)$ ,  $2b(3a^2 + b^2)$ ,  
 $4b(3a^2 + 4b^2)$ ,  $5(x-y)(7x^2 - 11xy + 19y^2)$ ,  $(x-y)(x+y)(x^4 + x^2y^2 + y^4)$ ,  
 $(x+y)(x^2 - xy + y^2)(x^6 - x^3y^3 + y^6)$