Factoring
Difference of Cubes
Worked Out Solutions

Factoring Difference of Cubes

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Name: _____

Use the difference of cubes formula to factor the following. Don't forget to factor out the GCF if necessary.

1. $x^3 - 8$
$= x^3 - 2^3$
$= (x - 2)(x^2 + x \cdot 2 + 2^2)$
$= (x - 2)(x^2 + 2x + 4)$

2. $t^3 - 1$
$= t^3 - 1^3$
$= (t - 1)(t^2 + t \cdot 1 + 1^2)$
$= (t - 1)(t^2 + t + 1)$

3. $27 - y^3$
$= 3^3 - y^3$
$= (3 - y)(3^2 + 3 \cdot y + y^2)$
$= (3 - y)(9 + 3y + y^2)$

4. $8t^3 - 27$
$= (2t)^3 - 3^3$
$= (2t - 3)[(2t)^2 + 2t \cdot 3 + 3^2]$
$= (2t - 3)(4t^2 + 6t + 9)$

5. $1 - 64x^3$
$= 1^3 - (4x)^3$
$= (1 - 4x)[1^2 + 1 \cdot 4x + (4x)^2]$
$= (1 - 4x)(1 + 4x + 16x^2)$

6. $2y^3 - 54$
$= 2(y^3 - 27)$ factor out GCF
$= 2(y^3 - 3^3)$
$= 2(y - 3)(y^2 + y \cdot 3 + 3^2)$
$= 2(y - 3)(y^2 + 3y + 9)$

7. $24t^4 - 3t$
$= 3t(8t^3 - 1)$ factor out GCF
$= 3t[(2t)^3 - 1^3]$
$= 3t(2t - 1)[(2t)^2 + 2t \cdot 1 + 1^2]$
$= 3t(2t - 1)(4t^2 + 2t + 1)$

8. $8 - 64t^3$
$= 8(1 - 8t^3)$ factor out GCF
$= 8[1^3 - (2t)^3]$
$= 8(1 - 2t)[1 + 1 \cdot 2t + (2t)^2]$
$= 8(1 - 2t)(1 + 2t + 4t^2)$

Alternate method:

$8 - 64t^3$
$= 2^3 - (4t)^3$
$= (2 - 4t)[2^2 + 2 \cdot 4t + (4t)^2]$
$= (2 - 4t)(4 + 8t + 16t^2)$
$= 2(1 - 2t) \cdot 4(1 + 2t + 4t^2)$
$= 8(1 - 2t)(1 + 2t + 4t^2)$
Don't forget to continue factoring as much as possible

9. $40x^2y - 135x^2y^4$
$= 5x^2y(8 - 27y^3)$ factor out GCF
$= 5x^2y[2^3 - (3y)^3]$
$= 5x^2y(2 - 3y)[2^2 + 2 \cdot 3y + (3y)^2]$
$= 5x^2y(2 - 3y)(4 + 6y + 9y^2)$

10. $x^6 - 27$
$= (x^2)^3 - 3^3$
$= (x^2 - 3)[(x^2)^2 + x^2 \cdot 3 + 3^2]$
$= (x^2 - 3)(x^4 + 3x^2 + 9)$