## 6.5 Factoring Binomials

# OBJECTIVE 1: Factoring the Difference of Two Squares

Reminder of special products from Chapter 5.

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

This binomial is called a difference of squares.

Factoring the Difference of Two Squares 
$$a^2-b^2=(a+b)(a-b)$$

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$$a^2-b^2=(a+b)(a-b)$$
 Helpful Hint Since multiplication is commutative, remember that the order of factors does not matter. In other words, 
$$a^2-b^2=(a+b)(a-b) \text{ or } (a-b)(a+b)$$

Example 1: Factor 
$$x^2 - 25$$

$$\alpha^2 = x^2 \qquad b^2 = 25$$

$$\alpha = x \qquad b = 5$$

$$(x+5)(x-5)$$
Practice 1:  $x^2 - 81$ 

$$\alpha = x \qquad b = 9$$

## Example 2: Factor each difference of squares.

a) 
$$4x^2 - 1$$

b) 
$$25a^2 - 9b^2$$

c) 
$$\sqrt{2} - \sqrt{\frac{4}{9}}$$
 $\sqrt{2} - \sqrt{\frac{4}{9}}$ 
 $\sqrt{2} - \sqrt{2}$ 
 $\sqrt{2} - \sqrt{2}$ 
 $\sqrt{2} - \sqrt{2}$ 

## Practice 2:

$$a) 9x^2 - \sqrt{1}$$

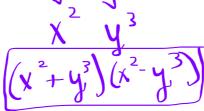
$$\sqrt{(3x+1)(3x-1)}$$

b) 
$$36a^2 - 49b^2$$

c) 
$$p^2 - \frac{25}{36}$$

$$(\rho + \frac{5}{6}) (p - \frac{5}{6})$$

## Example 3: Factor x<sup>4</sup> - y<sup>6</sup>



Practice 3: 
$$p^4 - q^{10}$$

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 $p^2 - q^5$ 

Example 4: Factor each binomial.

$$(2^{2}+9)(2^{2}-9)$$
 $(2^{2}+9)(2+3)(2-3)$ 

#### Helpful Hint

When factoring, don't forget:

- See whether the terms have a greatest common factor (GCF) (other than 1) that can be factored out.
- Other than the GCF, the sum of two squares cannot be factored using real numbers.
- Factor completely. Always check to see whether any factors can be factored further.

## Example 5 & 6: Factor each binomial.

$$5.4x^3 - 49x$$

$$6.162x^2 - 2$$

## Practice 5 & 6: Factor each binomial.

6. 
$$80y^2 - 5$$

5 (104) - 11

5 (4y + 1)(4y - 1)

Example 7: Factor - 
$$49x^2 + 16$$
-1 ( $49x^2 - 16$ )
-7x
- ( $7x + 4$ )( $7x - 4$ )

Practice 7: 
$$-9x^2 + 100$$

$$-\sqrt{9x^2} - \sqrt{000}$$

$$-\sqrt{3x} + \sqrt{000} \sqrt{3x - 100}$$

# OBJECTIVE 2: Factoring the Sum or Difference of Two Cubes

Sum of squares usually does not factor, but the sum and difference of cubes does work. The pattern leads to these two different formulas which I refer to as SOAP to help remember the signs of the formulas because the letters are the same in both!

Factoring the Sum or Difference of Two Cubes
$$a^{3} + b^{3} = (a + b)(a^{2} - ab + b^{2})$$

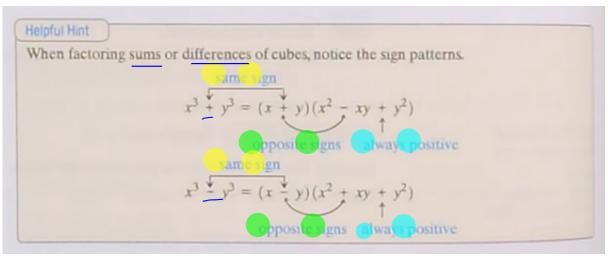
$$a^{3} + b^{3} = (a + b)(a^{2} - ab + b^{2})$$

\*\*\*Remember "factor" means to "write out as products"\*\*\*

Example 8: Factor, 
$$x^3 + x^8 = 50 \text{ AP}$$
  
 $(x+b)(a^2-ab+b^2)$   
 $(x+2)(x^2-2x+4)$ 

Practice 8: 
$$x^3 + 64$$
  
 $x = x$   $b = 4$   
 $(x + 4)(x^2 - 4x + 16)$ 





Example 9: Factor 
$$\sqrt{3} - \sqrt{27}$$
  $a = y$   $b = 3$   $(a - b)(a^2 + ab + b^2)$ 

Practice 9: 
$$x^3 - 3125$$
  $a = x$   $b = 5$   $(x-5)(x^3+5x+25)$ 

Example 10: Factor 
$$64x^3 + \sqrt{1}$$
 $4x$ 
 $4x + 1$ 

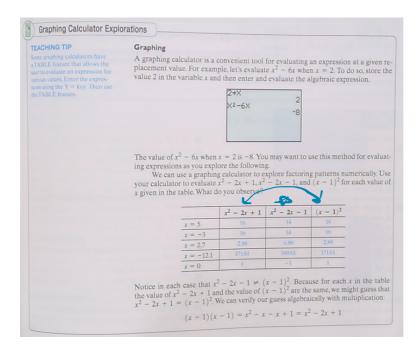
Practice 10: 
$$27y^3 + 1$$
 $3y$ 
 $(3y+1)(9y^2 - 3y+1)$ 

Example 11: Factor 
$$54a^3 - 16b^3$$

$$2(57a^3 - 36b^3)$$

$$2(3a - 2b)(9a^2 + 6ab + 4b^2)$$

Practice 11: 
$$32x^3 - 500y^3$$
 $4(8x^3 - 125y^3)$ 
 $4(2x-5y)(4x^2 + 10xy + 25y^2)$ 



Use the choices below	v to fill in each blank. Some choices may be used more than once and some choices may not be used at all
	ence of two squares sum of two cubes
	ence of two cubes  3 - 27 is called a difference of two cubes .
2. The expression x <sup>2</sup>	2 - 49 is called a difference of two squares .
	+ 1 is called a sum of two cubes binomial $y^2$ + 9 factors as $(y + 3)^2$ . false
Write each term as a s	
5. $49x^2 (7x)^2$	6. $25y^4 (5y^2)^2$
Write each term as a $(2y)^3$	Sube. 8. $x^6   (x^2)^3$

## 6.5 HW Assignment

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