

Algebra 1
Lesson 9.8B
Factor Completely

Warm-Up

Factor.

(a) $2x(x+4) - 3(x+4)$

$(x+4)(2x-3)$

(b) $(x^3 + 2x^2) + (8x + 16)$

$x^2(x+2) + 8(x+2)$

$(x+2)(x^2+8)$

(c) $(r^2 + 4r) + (rs + 4s)$

$r(r+4) + s(r+4)$

$(r+4)(r+s)$

(d) $(x^3 + 2x^2) + (5x - 10)$

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

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

CONCEPT SUMMARY

For Your Notebook

Guidelines for Factoring Polynomials Completely

To factor a polynomial completely, you should try each of these steps.

1. Factor out the greatest common monomial factor.
(Lesson 9.4)

$3x^2 + 6x = 3x(x + 2)$

2. Look for a difference of two squares or a perfect square trinomial. *(Lesson 9.7)*

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

3. Factor a trinomial of the form $ax^2 + bx + c$ into a product of binomial factors. *(Lessons 9.5 and 9.6)*

$3x^2 - 5x - 2 = (3x + 1)(x - 2)$

4. Factor a polynomial with four terms by grouping.
(Lesson 9.8)

$x^3 + x - 4x^2 - 4 = (x^2 + 1)(x - 4)$

Example 1. Factoring Completely

(a) $2x^2 - 14x + 24$

$2(x^2 - 7x + 12)$

$2(x-4)(x-3)$

(b) $x^2 - 4x - 3$

$(x+?)(x-?)$ Doesn't work!

NOT FACTORABLE (PRIME)

(c) $50h^4 - 2h^2$

$2h^2(25h^2 - 1)$

$2h^2(5h+1)(5h-1)$

(d) $2x^3 + 2x^2 - 4x$

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

$2x(x+2)(x-1)$

Try It!

(a) $3ab^2 - 6ab - 45a$

$$3a(b^2 - 2b - 15)$$

$$3a(b-5)(b+3)$$

(b) $3y^2 - 12y + 9$

$$3(y^2 - 4y + 3)$$

$$3(y-3)(y-1)$$

(c) $5x^2 - 20$

$$5(x^2 - 4)$$

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

(d) $n^2 + 2n - 1$

$$(n+?)(n-?) \text{ Doesn't work!}$$

NOT FACTORABLE (PRIME)

Example 2. Solve by Factoring

(a) $3x^3 + 18x^2 = -24x$

$$3x^3 + 18x^2 + 24x = 0$$

$$3x(x^2 + 6x + 8) = 0$$

$$3x(x+4)(x+2) = 0$$

$$\begin{array}{l} \downarrow \quad \downarrow \quad \downarrow \\ 3x=0 \text{ or } x+4=0 \text{ or } x+2=0 \\ \hline x=0 \text{ or } x=-4 \text{ or } x=-2 \end{array}$$

$$x=0, -4, -2$$

(b) $x^3 - 25x = 0$

$$x(x^2 - 25) = 0$$

$$x(x+5)(x-5) = 0$$

$$\downarrow \quad \downarrow \quad \downarrow \\ x=0 \text{ or } x+5=0 \text{ or } x-5=0 \\ \hline x=0 \text{ or } x=-5 \text{ or } x=5$$

$$x=0 \text{ or } x=-5 \text{ or } x=5$$

$$x=0, \pm 5$$

(c) $c^3 - 7c^2 + 12c = 0$

$$c(c^2 - 7c + 12) = 0$$

$$c(c-4)(c-3) = 0$$

$$c=0, 4, 3$$

(d) $4x^2 + 8x - 32 = 0$

$$4(x^2 + 2x - 8) = 0$$

$$4(x+4)(x-2) = 0$$

$$x=-4, 2$$

Assignment

New: Pgs. 610 - 611 #24 - 54 (evens)

Review:

Factor Completely

1. $2x^2 - 3x - 5$

2. $3x^2 - 12$

3. $6x^2 - 3x - 9$

4. $x^4 - 81$

5. $4x^2 + 2x - 6$

6. $2u^2 + 16$

7. $3x^2 + 30x + 75$

8. $x^4 - y^4$