

3. $2x(x - 2)$ 1 & 2. See next page.
4. $4mn(m - 2n + 3mn)$
5. $(x + 1)(x - 1)$
6. $(5x - 6y)(5x + 6y)$
7. $(x - 3)(x + 4)(x - 4)$
8. $5x^3(x^3 + 3)$
9. $(11x + 5y)(11x - 5y)$
10. $(16x^2 + 1)(4x + 1)(4x - 1)$
11. $(x + 4)(x + 3)(x - 3)$
12. $6rs(5s - 4r + 1)$
13. $y^a(y^a + 1)(y^a - 1)$
14. $9(3x + y)(3x - y)$
15. $-11x^3 + x^2 + 8x + 4$
16. $-3x^3y^4 - 6x^4y^2 + 12x^2y^3 - 9x^2y^2$
17. $10a^2 - 33ab + 27b^2$
18. $-7x^3 + 26x^2 - 10x - 15$

1-4 HW Answer Key

1. Algebraically prove why $a^2 - b^2 = (a+b)(a-b)$ by simplifying the right side.

$$\begin{aligned} a^2 - b^2 &= a^2 + \overbrace{ab - ab} - b^2 \\ a^2 - b^2 &= a^2 - b^2 \end{aligned}$$

2. Using $a=5$ and $b=2$, show that $a^2 - b^2 = (a+b)(a-b)$ is true.

$$\begin{aligned} (5)^2 - (2)^2 &= (5+2)(5-2) \\ 25 - 4 &= (7)(3) \\ 21 &= 21 \end{aligned}$$

Factor completely:

3. $2x^2 - 4x$ ^{GCF}
 $= 2x(x-2)$

4. $4m^2n - 8mn^2 + 12m^2n^2$ ^{GCF}
 $= 4mn(m-2n+3mn)$

5. $x^2 - 1$ ^{DOTS}
 $= (x+1)(x-1)$

6. $25x^2 - 36y^2$ ^{DOTS}
 $= (5x-6y)(5x+6y)$

7. $x^3 - 3x^2 - 16x + 48$ ^{Grouping}
 $= x^2(x-3) - 16(x-3)$
 $= (x-3)(x^2-16)$
 $= (x-3)(x+4)(x-4)$

8. $5x^6 + 15x^3$ ^{GCF}
 $= 5x^3(x^3+3)$

9. $121x^2 - 25y^2$ ^{DOTS}
 $= (11x+5y)(11x-5y)$

10. $256x^4 - 1$ ^{Diff DOTs}
 $= (16x^2+1)(16x^2-1)$
 $= (16x^2+1)(4x+1)(4x-1)$

11. $x^3 + 4x^2 - 9x - 36$ ^{Group DOTs}
 $= x^2(x+4) - 9(x+4)$
 $= (x+4)(x^2-9)$
 $= (x+4)(x+3)(x-3)$

12. $30rs^2 - 24r^2s + 6rs$ ^{GCF}
 $= 6rs(5s-4r+1)$

13. $y^{3a} - y^a$ ^{GCF/DOTS}
 $= y^a(y^{2a}-1)$
 $= y^a(y^{a+1})(y^a-1)$

14. $81x^2 - 9y^2$ ^{GCF/DOTS}
 $= 9(9x^2 - y^2)$
 $= 9(3x+y)(3x-y)$

Simplify by rewriting after
 Rewrite each polynomial in standard form by applying the operations in the appropriate order.

$$\begin{aligned} 15. (2x^2 + 3x + 4) - (11x^3 + x^2 - 5x) \\ = 2x^2 + 3x + 4 - 11x^3 - x^2 + 5x \\ = -11x^3 + x^2 + 8x + 4 \end{aligned}$$

$$\begin{aligned} 16. -3xy^2(2x^3 + x^2y^2 - 4xy + 3x) \\ = -6x^4y^2 - 3x^3y^4 + 12x^2y^3 - 9x^2y^2 \\ = -3x^3y^4 - 6x^4y^2 + 12x^2y^3 - 9x^2y^2 \end{aligned}$$

$$\begin{aligned} 17. (2a - 3b)(5a - 9b) \\ = 10a^2 - 18ab - 15ab + 27b^2 \\ = 10a^2 - 33ab + 27b^2 \end{aligned}$$

$$\begin{aligned} 18. (5 + 5x - 7x^2)(x - 3) \\ = x(5 + 5x - 7x^2) - 3(5 + 5x - 7x^2) \\ = \underline{5x} + \underline{5x^2} - \underline{7x^3} - \underline{15} - \underline{15x} + \underline{21x^2} \\ = -7x^3 + 26x^2 - 10x - 15 \end{aligned}$$

1-5: Factoring Long and Short Product/Sum $ax^2 + bx + c$ Factoring Trinomials using Product/Sum (with leading coefficient $\neq 1$):

Example: Factor the following trinomials using Product/Sum long form.

1. $2x^2 + 13x + 6$ $\text{Prod} = a \cdot c = 2(6) = 12$
 $\text{Sum} = b = 13$

$$\begin{array}{r} 2x^2 + 1x + 12x + 6 \\ x(2x+1) + 6(2x+1) \\ (2x+1)(x+6) \end{array}$$

2. $6x^2 - 13x + 5$

$\text{Prod} = 6(5) = 30$
 $\text{Sum} = -13$ $y = \frac{30}{x}$

$$\begin{array}{r} 6x^2 - 3x - 10x + 5 \\ 3x(2x-1) - 5(2x-1) \\ (2x-1)(3x-5) \end{array}$$

NORMAL FLOAT AUTO REAL RADIAN PRESS + FOR Δ b1			
X	Y1		
1	30		
2	15		
3	10	$\rightarrow P = -30$	
4	7.5	$\rightarrow P = 30$	
5	6		
6	5		
7	4.2857		
8	3.75		
9	3.3333		
10	3		
11	2.7273		

X=1

3. $4x^2 + 4x - 3$ $\text{Prod} = -12$
 $\text{Sum} = 4$

$$\begin{array}{r} 4x^2 - 2x + 6x - 3 \\ 2x(2x-1) + 3(2x-1) \\ (2x-1)(2x+3) \end{array}$$

4. $4x^2 - 4x - 3$

$$(2x+1)(2x-3)$$

5. $3x^2 + 7x + 2$ $P=6$
 $S=7$ 4,1

$$\underbrace{3x^2 + 6x + x + 2}$$

$$3x(x+2) + 1(x+2)$$

$$(x+2)(3x+1)$$

6. $3x^2 - 7x + 2$

7. $5x^2 + 2x - 3$ $P=-15$
 $S=2$ 5, -3

$$5x^2 + 5x - 3x - 3$$

$$5x(x+1) - 3(x+1)$$

$$(x+1)(5x-3)$$

8. $5x^2 - 2x - 3$

Factoring Trinomials (with leading coefficient = 1): $a=1$ Example: Factor the following trinomials using Product/Sum short cut.

1. $x^2 + 6x + 8$ $\text{Prod} = 1(8) = 8$
 $\text{Sum} = 6$
 $(x+2)(x+4)$ ← 2, 4
 fast forward to
 answer because
 $a=1$

2. $x^2 - 13x + 40$ $\text{Prod} = 40$
 $\text{Sum} = -13$

40
<u>+ 40</u>
<u>- 20</u>
<u>- 40</u>
-5 -8

$(x-5)(x-8)$

3. $x^2 - 3x - 40$ $P = -40$
 $S = -3$
 $(x-8)(x+5)$ -8 5

4. $x^2 + 3x - 10$ $P = -10$
 $S = 3$
 $(x-2)(x+5)$ -2 5

$$5. x^2 + 7x + 6$$

$$(x+1)(x+6)$$

$$P=6$$

$$S=7$$

$$1, 6$$

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

$$(x+2)(x+3)$$

$$P=6$$

$$S=5$$

$$\begin{array}{r} 6 \\ -1 6 \\ \hline 2 3 \end{array}$$

$$7. x^2 + 5x - 6$$

$$(x-1)(x+6)$$

$$P=-6$$

$$S=5$$

$$\begin{array}{r} 6 \\ -1 6 \\ \hline -2 5 \end{array}$$

$$8. x^2 - 6x + 5$$

$$(x-1)(x-5)$$

$$P=5$$

$$S=-6$$

$$\begin{array}{r} 5 \\ -1 5 \\ \hline -1 5 \end{array}$$

add: 3 terms, 2nd term exponent is $\frac{1}{2}$ of the 1st term exponent.

$$X^{\textcircled{4}} + 6X^{\textcircled{2}} + 5 \quad \begin{matrix} p=5 \\ s=6 \\ 1,5 \end{matrix} \quad X^6 + 6X^3 + 5 \quad \begin{matrix} \text{3rd term} \\ \text{no Var.} \end{matrix}$$

$$(x^2+1)(x^2+5) \quad (x^3+1)(x^3+5)$$

Factor Completely: $2y^3 + 6y^2 + 4y$

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

$$\boxed{2y(y+1)(y+2)}$$

$$\begin{array}{l} P=2 \\ S=3 \\ 1, 2 \end{array}$$

What is different about this one? Try factoring it.

2 variables

$$x^2 + 2xy - 24y^2$$

$$P = -24$$

long P/S

$$S = 2$$

$$6, -4$$

$$\overbrace{x^2 + 6xy - 4xy - 24y^2}$$

$$x(x + 6y) - 4y(x + 6y)$$

$$\boxed{(x + 6y)(x - 4y)}$$

$$ax^2 + bx + c$$

Describe what is different about factoring the following trinomials, and then factor them.

$$x^2 + 6x + 8$$

short P/S
b/c $a=1$

and

$$2x^2 + 13x + 6$$

long P/S
b/c $a \neq 1$

HWK 1-5
#1)

$$(2x+3)(x+2)$$

$$\#2) (4x-3)(4x+1)$$