

1-5 HW Answer Key

1. $(x+2)(2x+3)$
2. $(4x-3)(4x+1)$
3. $(x-6)(x-1)$
4. $(x-3)(x+2)$
5. $2x(x+1)(x+2)$
6. $3x(x+1)(x+3)$
7. $3y(y-5)(y+1)$
8. $4m(m+4)(m-4)$
9. x^2-3x+1
10. $-2x^2-7x+16$
11. $-9x^2+2x-2$
12. $-10x^3y^4z^3-35x^3y^2z^5+15x^2y^3z^4-25x^5yz^3$

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Alg 2 Homework 1-5

Name Key

Factor and check #s 2 and 4. Remember to check by multiplying the factors.

$$\begin{aligned}
 1. \quad & 2x^2+7x+6 \quad p=12, s=7, 3, 4 \quad \text{ch} \\
 & = 2x^2+4x+3x+6 \\
 & = 2x(x+2)+3(x+2) \\
 & = (x+2)(2x+3) \\
 & \quad (x+2)(2x+3) \\
 & \quad = 2x^2+3x+4x+6 \\
 & \quad = 2x^2+7x+6 \checkmark
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & 16x^2-8x-3 \quad p=48, s=-3, 4, -12 \quad \text{ch} \\
 & = 16x^2-12x+4x-3 \\
 & = 4x(4x-3)+1(4x-3) \\
 & = (4x-3)(4x+1) \\
 & \quad (4x-3)(4x+1) \\
 & \quad = 16x^2+4x-12x-3 \\
 & \quad = 16x^2-8x-3 \checkmark
 \end{aligned}$$

$$\begin{aligned}
 3. \quad & x^2-7x+6 \quad p=-6, s=-7, -6, -1 \quad \text{ch} \\
 & = (x-6)(x-1) \\
 & \quad (x-6)(x-1) \\
 & \quad = x^2-x-6x+6 \\
 & \quad = x^2-7x+6 \checkmark
 \end{aligned}$$

$$\begin{aligned}
 4. \quad & x^2-x-6 \quad p=-6, s=-1, -3, 2 \quad \text{ch} \\
 & = (x-3)(x+2) \\
 & \quad (x-3)(x+2) \\
 & \quad = x^2+2x-3x-6 \\
 & \quad = x^2-x-6 \checkmark
 \end{aligned}$$

Factor the following expressions completely.

$$\begin{aligned}
 5. \quad & 2x^3+6x^2+4x \quad p=2, s=3, 1, 2 \\
 & = 2x(x^2+3x+2) \\
 & = 2x(x+1)(x+2) \\
 6. \quad & 3x^3+12x^2+9x \quad p=3, s=4, 1, 3 \\
 & = 3x(x^2+4x+3) \\
 & = 3x(x+1)(x+3)
 \end{aligned}$$

$$\begin{aligned}
 7. \quad & 3y^3-12y^2-15y \quad p=-5, s=-4, -5, 1 \\
 & = 3y(y^2-4y-5) \\
 & = 3y(y-5)(y+1) \\
 8. \quad & 4m^3-64m \\
 & = 4m(m^2-16) \\
 & = 4m(m+4)(m-4)
 \end{aligned}$$

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Simplify by re-writing each polynomial in standard form after applying the operations in the appropriate order.

9. $(x^3 - 7x^2 + 13x - 4) \div (x - 4)$

$$\begin{array}{r} x^2 - 3x + 1 \\ x-4 \overline{) x^3 - 7x^2 + 13x - 4} \\ \underline{-x^3 + 4x^2} \\ -3x^2 + 13x \\ \underline{+3x^2 - 12x} \\ x \\ \underline{-x + 4} \\ 0 \end{array}$$

10. $(5x^2 - 4x + 7) + (-3x + 9 - 7x^2)$

$$= -2x^2 - 7x + 16$$

11. Subtract $(3x^2 - 2x + 9)$ from $(7 - 6x^2)$

$$\begin{aligned} & (7 - 6x^2) - (3x^2 - 2x + 9) \\ &= 7 - 6x^2 - 3x^2 + 2x - 9 \\ &= -9x^2 + 2x - 2 \end{aligned}$$

12. $-5x^2yz^3(2xy^3 + 7xyz^2 - 3y^2z + 5x^3)$

$$= -10x^3y^4z^3 - 35x^3y^2z^5 + 15x^2y^3z^4 - 25x^5yz^3$$

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1-6: Sum/Difference of Cubes

Warm-up: Factor Completely.

1. $x^2 - 25 = (x + 5)(x - 5)$

2. $x^4 - 625 = (x^2 - 25)(x^2 + 25)$
 $= (x + 5)(x - 5)(x^2 + 25)$

$$2^3 = 2 \cdot 2 \cdot 2 = 8$$

multiply

Is $x^3 - 8 = (x - 2)(x - 2)(x - 2)$? Algebraically justify your answer.

$$x^3 - 8 = (x^2 - 4x + 4)(x - 2)$$

$$x^3 - 8 = x(x^2 - 4x + 4) - 2(x^2 - 4x + 4)$$

$$x^3 - 8 = x^3 - 4x^2 + 4x - 2x^2 + 8x - 8$$

$$x^3 - 8 = x^3 - 6x^2 + 12x - 8$$

NO - not =

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We can factor binomials that are sums or differences of cubes. First complete the following table to prepare for this factoring method.

	x	x^2	x^3
Integer	Square	Cube	
1	1	1	
2	4	8	
3	9	27	
4	16	64	
5	25	125	

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Factoring sum or difference of cubes:

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

keep change plus

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

Example: Factor $x^3 - 8$

This is $x^3 - 2^3$, so we get:

$$\begin{aligned} x^3 - 8 &= x^3 - 2^3 \\ &= (x - 2)(x^2 + 2x + 2^2) \\ &= (x - 2)(x^2 + 2x + 4) \end{aligned}$$

$$x^3 + 8$$

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Try these. Remember

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

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

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

$$a = \sqrt[3]{x^3} = x \quad b = \sqrt[3]{8} = 2$$

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

$$2. y^3 - 125 = (y - 5)(y^2 + 5y + 5^2)$$

$$a = \sqrt[3]{y^3} = y \quad b = \sqrt[3]{125} = 5$$

$$= (y - 5)(y^2 + 5y + 25)$$

$$3. x^3 - 64 = (x - 4)(x^2 + 4x + 4^2)$$

$$a = x \quad b = 4$$

$$= (x - 4)(x^2 + 4x + 16)$$

$$4. 64 - x^3 = (4 - x)(4^2 + 4x + x^2)$$

$$a = 4 \quad b = x$$

$$= (4 - x)(16 + 4x + x^2)$$

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$$5. 64x^3 + 1 = (4x + 1)((4x)^2 - 4x + 1^2)$$

$$a = \sqrt[3]{64x^3} = 4x \quad b = \sqrt[3]{1} = 1$$

$$= (4x + 1)(16x^2 - 4x + 1)$$

$$6. 125y^3 - 1 = (5y - 1)((5y)^2 + 5y + 1^2)$$

$$a = (5y)^2 \quad b = 1$$

$$= (5y - 1)(25y^2 + 5y + 1)$$

Factor the following and verify that the factored expression is equivalent to the original.

$$y^3 + 125 = (y + 5)(y^2 - 5y + 5^2)$$

$$a = y \quad b = 5$$

$$= (y + 5)(y^2 - 5y + 25)$$

Check

$$= (y + 5)(y^2 - 5y + 25)$$

$$= y(y^2 - 5y + 25) + 5(y^2 - 5y + 25)$$

$$= y^3 - 5y^2 + 25y + 5y^2 - 25y + 125$$

$$= y^3 + 125$$

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$$x^3 + 64 = (x+4)(x^2 - 4x + 16)$$

Check

$$(x+4)(x^2 - 4x + 16)$$
$$= x^3 - 4x^2 + 16x + 4x^2 - 16x + 64$$
$$= x^3 + 64 \checkmark$$

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