Writing Polynomials in Standard Form

Name: _____	Date: _____	Score: _____ / 36

Quick Review

Standard form of a polynomial lists the terms in *descending* order of degree — highest exponent first, constant last. So $3-2x+x^2$ becomes x^2-2x+3. The signs travel with their terms: $4-5x^3-x^2$ rewrites as $-5x^3-x^2-0\cdot x+4$, or more simply $-5x^3-x^2+4$.

The **degree** of a polynomial is the largest exponent on the variable. The **leading coefficient** is the number sitting in front of that highest-degree term (with its sign). So for $-2x^4+5x^2-7x+1$, the degree is 4 and the leading coefficient is -2 (not 2 — keep the minus sign).

Before standardizing, **combine like terms**. Like terms share the *same variable and the same exponent*: $3x^2$ and $5x^2$ are like; $3x^2$ and $5x$ are not. After combining, sort the surviving terms by degree. Watch the common trap of treating a constant as the *leading* term just because it's written first — it's actually degree 0, the lowest.

The constant term is the piece with no variable factor (degree 0). Standard form does *not* require the leading coefficient to be positive, and it does *not* require you to write missing powers as $0\cdot x^k$ — you can just skip them.

PRACTICE

Write each polynomial in standard form. State the degree and leading coefficient when asked.

1. $5+3x^2-2x$ _____
2. $4-5x^3+2x-x^2$ _____
3. $3x^2+5x-7+2x^2-3x+1$ _____
4. $2+3t^4-t+5t^2-7t^3$ _____
5. $9+2x^5-4x^2+3x-x^3$ _____
6. $-2x^4+7x-3+5x^2+4x^4-9x$ (combine, then standardize) _____
7. $3x^2-7+5x^4-2x$ _____
8. The table lists the terms of $-7x^3+4x^5-2x+1$ with their degrees. Use it to state the polynomial's degree and leading coefficient. _____

Term	Degree
$-7x^3$	3
$4x^5$	5
$-2x$	1
1	0

9. The table lists the terms of $6x-2x^4+x^2-9$ with their degrees. Use it to state the degree and leading coefficient. _____

Term	Degree
$6x$	1
$-2x^4$	4
x^2	2
-9	0

10. $7-3x+x^2$ _____
11. $6x^3-x^5+2-4x$ _____
12. $4x^2+2x^3-x^2+5$ _____
13. $x+x^4-x^2+x^3$ _____

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14. Constant term of $3x^4 - 2x + 8x^2 - 11$ _____

15. $-3 + 4x - x^3$ _____

16. $2x^2 - x^4 + 3x^2 + x^4$ _____

17. Standard form: $5x - 2x^3 + 7 - x^2 + 6x^3$ _____

18. Is $5 + x^2 - 2x$ in standard form? _____

19. For $4x^2y^3 - x^4y + 2$ the table records each term's x-power and y-power. Use it to find the polynomial's degree. _____

Term	power of x	power of y
$4x^2y^3$	2	3
$-x^4y$	4	1
2	0	0

20. If $ax^3 + 2x^3 + 5$ has leading coefficient -3, find a _____

♦ Word Problems

21. A trajectory model is given by $h(t) = 2 + 3t^4 - t + 5t^2 - 7t^3$. Rewrite $h(t)$ in standard form; state its degree and leading coefficient. ____

22. A profit polynomial is $P(x) = -3x + 5x^2 + 12 - 2x^2 + x^3 - 4x$. Write $P(x)$ in standard form. ____

23. The polynomial $g(x) = kx^4 - 3x^2 + x - 2x^4 + 8$ has leading coefficient 5 when written in standard form. Find k. ____

24. Two students disagree about the polynomial $f(x) = 4 - x^2 + 3x^5 - x$. Alex writes it as $4 - x - x^2 + 3x^5$ and Bri writes it as $3x^5 - x^2 - x + 4$. Whose version is in standard form, and why? ____

Additional Practice

25. Write $3x - 5 + x^3$ in standard form. _____

26. Find the degree of $7x^4 - 2x^2 + 9$. _____

27. Add $(2x^2 + 3x - 1) + (x^2 - 5x + 4)$. _____

28. Subtract $(5x^2 - x + 6) - (2x^2 + 3x - 1)$. _____

29. Multiply $(x + 4)(x - 3)$. _____

30. Factor $x^2 + 9x + 20$. _____

31. Factor $6x^2 + 9x$. _____

32. Find the GCF of $12x^3$ and $18x^2$. _____

33. Divide $(x^2 + 5x + 6)$ by $(x + 2)$. _____

34. Find the remainder when $x^2 - 1$ is divided by $x - 3$. _____

35. Zeros of $(x - 5)(x + 1)$. _____

36. Is $x = 2$ a zero of $x^2 - 4$? _____

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Answer Keys

1. $3x^2 - 2x + 5$
2. $-5x^3 - x^2 + 2x + 4$
3. $5x^2 + 2x - 6$
4. $3t^4 - 7t^3 + 5t^2 - t + 2$
5. $2x^5 - x^3 - 4x^2 + 3x + 9$
6. $2x^4 + 5x^2 - 2x - 3$
7. $5x^4 + 3x^2 - 2x - 7$
8. degree 5, leading coef. 4
9. degree 4, leading coef. -2
10. $x^2 - 3x + 7$
11. $-x^5 + 6x^3 - 4x + 2$
12. $2x^3 + 3x^2 + 5$
13. $x^4 + x^3 - x^2 + x$
14. -11
15. $-x^3 + 4x - 3$
16. $5x^2$
17. $4x^3 - x^2 + 5x + 7$
18. no; standard form is $x^2 - 2x + 5$
19. 5
20. $a = -5$
21. $h(t) = 3t^4 - 7t^3 + 5t^2 - t + 2$, degree 4, lead coef. 3
22. $P(x) = x^3 + 3x^2 - 7x + 12$
23. $k = 7$
24. Bri — her terms run from degree 5 down to degree 0

Additional Practice Answers

25. $x^3 + 3x - 5$
26. 4
27. $3x^2 - 2x + 3$
28. $3x^2 - 4x + 7$
29. $x^2 + x - 12$
30. $(x + 4)(x + 5)$
31. $3x(2x + 3)$
32. $6x^2$
33. $x + 3$
34. 8
35. $x = 5, -1$
36. yes

Additional Practice: Answers for all numbered items, including the added practice, are shown in the grid above.

Step-by-Step Explanations

1. Sort by exponent, highest first: $3x^2$ (degree 2), then $-2x$ (degree 1), then 5 (degree 0). The signs stay with their terms.

2. Highest power is x^3, so $-5x^3$ comes first. Then $-x^2$, then $2x$, then 4. Drag the minus signs along — forgetting that the $-x^2$ stays negative is the easy slip.

3. Combine like terms first: $3x^2 + 2x^2 = 5x^2$, $5x - 3x = 2x$, $-7 + 1 = -6$. Now you have a clean trinomial in standard form.

4. Order by exponent: t^4, t^3, t^2, t, constant. So $3t^4 - 7t^3 + 5t^2 - t + 2$. The degree is 4.

5. Sort: $2x^5$, $-x^3$, $-4x^2$, $3x$, 9. Skip the missing x^4 entirely — standard form doesn't need a zero placeholder.

6. Combine like terms: $-2x^4 + 4x^4 = 2x^4$, $7x - 9x = -2x$, leaving $5x^2$ and -3 alone. Standard form: $2x^4 + 5x^2 - 2x - 3$, degree 4.

7. Order: $5x^4$, then $3x^2$, then $-2x$, then -7. The missing x^3 is just skipped.

8. Scan the Degree column for the largest value: 5, belonging to the term $4x^5$. So the degree is 5 and the leading coefficient is 4 (positive, not the -7 that sat first in the original).

9. The largest degree in the table is 4, on the term $-2x^4$. So the degree is 4 and the leading coefficient is -2. Keep the minus sign — it travels with the term.

10. Read off each term's degree: x^2 is degree 2, $-3x$ is degree 1, 7 is degree 0. Descending order puts the highest first: $x^2 - 3x + 7$. Each sign rides along with its term.

11. Order by exponent: $-x^5$, $6x^3$, $-4x$, 2. The x^5 term has coefficient -1 (we write $-x^5$, not $-1x^5$).

12. Start with the key idea: Combine like terms: $4x^2 - x^2 = 3x^2$. Then sort: $2x^3$, $3x^2$, 5. That gives a quick check on the answer.

13. No like terms to combine, so just rearrange by degree, highest first: x^4, then x^3, then $-x^2$, then x. Every coefficient here is ± 1, but the ordering and the $-$ on x^2 still matter.

14. The constant term is the degree-0 piece — the one with no variable factor. Here that's -11. (Easy trap: thinking the constant is the very first number written.)

15. Highest degree is 3, so $-x^3$ leads (no x^2 term to write). Then $4x$, then the constant -3. The cubic's coefficient is -1, written simply as $-x^3$.

16. Watch the cancellation: $-x^4 + x^4 = 0$, and $2x^2 + 3x^2 = 5x^2$. What looked like a quartic collapses to a single term.

17. A careful way to see it: Combine $-2x^3 + 6x^3 = 4x^3$, then sort: $4x^3, -x^2, 5x, 7$. That gives a quick check on the answer.

18. Standard form needs descending exponents. The original starts with the constant 5, then x^2, then $-2x$ — that's the wrong order. Rewrite as $x^2 - 2x + 5$.

19. For a multi-variable monomial, the degree is the sum of the exponents — add the two power columns in each row: $2 + 3 = 5$, $4 + 1 = 5$, $0 + 0 = 0$. The polynomial's degree is the largest of these: 5.

20. Combine the cubes: $ax^3 + 2x^3 = (a + 2)x^3$. Set $a + 2 = -3$: $a = -5$. Standard form: $-3x^3 + 5$.

21. Sort the terms by exponent: $3t^4, -7t^3, 5t^2, -t, 2$. So $h(t) = 3t^4 - 7t^3 + 5t^2 - t + 2$. The biggest power is 4, and the coefficient on t^4 is 3, so the leading coefficient is 3. (A common slip is to pick the number that appears first in the original line instead of the one on the highest-degree term.)

22. Combine like terms first. Squares: $5x^2 - 2x^2 = 3x^2$. Linear: $-3x - 4x = -7x$. The cube and constant stand alone. Now order by degree: $x^3 + 3x^2 - 7x + 12$.

23. Combine the x^4 terms: $kx^4 - 2x^4 = (k - 2)x^4$. This is the leading term (highest exponent), so $k - 2 = 5$, giving $k = 7$. Plugging back, the polynomial is $5x^4 - 3x^2 + x + 8$ — a clean quartic.

24. Standard form means *descending* exponents. Bri's order is $5, 2, 1, 0$ — strictly decreasing. Alex's order is $0, 1, 2, 5$ — ascending, the opposite convention. So Bri's version is in standard form. (Either ordering represents the same polynomial; standard formis just the agreed convention.)

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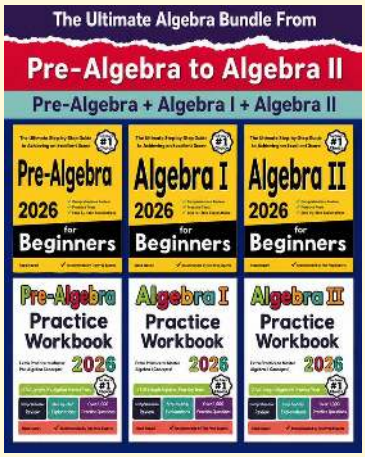

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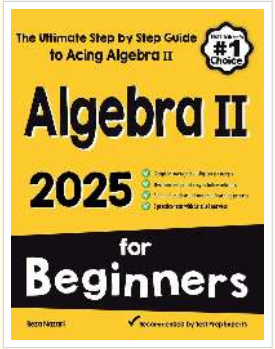

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