

Class 11 — Factoring Polynomials & the Remainder / Factor Theorems

Young Fermats Algebra II · 25 practice questions · print-friendly

Name: _____ Date: _____

How to use this worksheet. Attempt every question on paper first — write your factored form or numerical answer on the lines under each prompt. When you're done, check yourself against the answer key on the last page. For step-by-step explanations of every question, read the full class post at schoolofmath.us/posts/algebra-2-class-11-factoring-polynomials-remainder-factor-theorems.

What's covered. Questions 1–5 warm up the five factoring techniques (GCF, trinomials, difference of squares, perfect squares, grouping). Questions 6–12 combine techniques. Questions 13–17 use the **Remainder Theorem**. Questions 18–22 use the **Factor Theorem** (including the sign trap for $x + a$). Questions 23–25 completely factor a cubic using the Factor Theorem paired with synthetic division.

Honors Algebra II · Grades 9–11 · 60-minute class · Aligned to NY Algebra II / Common Core (A-APR.B.2, A-APR.B.3, A-SSE.A.2)

1. GCF

Factor completely: $12x^3 + 18x^2$.

Your answer:

2. Trinomial

Factor: $x^2 + 7x + 12$.

Your answer:

3. Diff of squares

Factor: $x^2 - 25$.

Your answer:

4. Perfect square

Factor: $x^2 - 10x + 25$.

Your answer:

5. Trinomial

Factor: $x^2 - 3x - 10$.

Your answer:

6. GCF + trinomial

Factor completely: $2x^2 + 10x + 12$.

Your answer:

7. GCF + diff of squares

Factor completely: $3x^3 - 12x$.

Your answer:

8. Grouping

Factor by grouping: $x^3 + 2x^2 + 3x + 6$.

Your answer:

9. Trinomial with a

Factor: $2x^2 + 7x + 3$.

Your answer:

10. Perfect square

Factor: $9x^2 + 12x + 4$.

Your answer:

11. Diff of squares

Factor: $49 - x^2$.

Your answer:

12. Zeros

Find the zeros of $f(x) = x^2 + 4x - 5$.

Your answer:

13. Remainder

Use the Remainder Theorem to find the remainder when $f(x) = x^3 - 4x^2 + x + 6$ is divided by $x - 3$.

Your answer:

14. Remainder

Find the remainder when $f(x) = 2x^3 + 3x^2 - x + 5$ is divided by $x - 1$.

Your answer:

15. Remainder

Find the remainder when $f(x) = x^4 - 3x^2 + 2$ is divided by $x + 2$.

Your answer:

16. Remainder

Find the remainder when $f(x) = x^3 - 2x + 4$ is divided by $x + 1$.

Your answer:

17. Remainder + interpret

Given $f(x) = x^3 + kx^2 - 4x + 12$, find the value of k so that dividing by $x - 2$ leaves a remainder of 0.

Your answer:

18. Factor test

Is $(x - 1)$ a factor of $f(x) = x^3 - x^2 - 4x + 4$? Justify.

Your answer:

19. Sign trap

Is $(x + 3)$ a factor of $f(x) = x^3 + 3x^2 - 4x - 12$? Justify.

Your answer:

20. Sign trap

Is $(x + 1)$ a factor of $f(x) = x^3 + 3x^2 - 4x - 12$? Justify.

Your answer:

21. Sign trap

What value should you substitute into $f(x)$ to check whether $(x + 7)$ is a factor?

Your answer:

22. Find a factor

Given $f(x) = x^3 - 7x + 6$, test small integer values and find one linear factor of $f(x)$.

Your answer:

23. Cubic

Completely factor $f(x) = x^3 - 6x^2 + 11x - 6$, then list its zeros.

Your answer:

24. Cubic

Completely factor $f(x) = x^3 + 2x^2 - 5x - 6$, then list its zeros.

Your answer:

25. Challenge

Completely factor $f(x) = 2x^3 - x^2 - 8x + 4$, then list its zeros.

Your answer:

Answer key

For step-by-step explanations of every question, read the full class post at schoolofmath.us/posts/algebra-2-class-11-factoring-polynomials-remainder-factor-theorems.

1. $6x^2(2x + 3)$.
2. $(x + 3)(x + 4)$.
3. $(x - 5)(x + 5)$.
4. $(x - 5)^2$.
5. $(x - 5)(x + 2)$.
6. $2(x + 2)(x + 3)$.
7. $3x(x - 2)(x + 2)$.
8. $(x + 2)(x^2 + 3)$.
9. $(2x + 1)(x + 3)$.
10. $(3x + 2)^2$.
11. $(7 - x)(7 + x)$.
12. $x = -5$ and $x = 1$ (factored form: $(x + 5)(x - 1)$).
13. 0. Because $f(3) = 27 - 36 + 3 + 6 = 0$.
14. 9. $f(1) = 2 + 3 - 1 + 5 = 9$.
15. 6. For $(x + 2)$, test $f(-2) = 16 - 12 + 2 = 6$.
16. 5. $f(-1) = -1 + 2 + 4 = 5$.
17. $k = -3$. $f(2) = 8 + 4k - 8 + 12 = 4k + 12$; set to 0.
18. Yes. $f(1) = 1 - 1 - 4 + 4 = 0$.
19. Yes. Test $f(-3) = -27 + 27 + 12 - 12 = 0$.
20. No. $f(-1) = -1 + 3 + 4 - 12 = -6 \neq 0$.
21. $f(-7)$. Rewrite $(x + 7)$ as $x - (-7)$, so $a = -7$.
22. $(x - 1)$ is a factor. $f(1) = 1 - 7 + 6 = 0$. (Also $(x - 2)$ and $(x + 3)$ are factors.)
23. $(x - 1)(x - 2)(x - 3)$. Zeros: $x = 1, 2, 3$.
24. $(x - 2)(x + 1)(x + 3)$. Zeros: $x = 2, -1, -3$.
25. $(2x - 1)(x - 2)(x + 2)$. Zeros: $x = 1/2, 2, -2$.

Ready for the next class? Young Fermats Algebra II meets weekly at 226 W 79th Street on the Upper West Side. Book a free 30-minute evaluation at schoolofmath.us/evaluation or call **(646) 668-6151**. Class 12 is **Zeros of Polynomials — the Rational Root Theorem and end behavior**.