Zeros, Factors, and Complex Numbers

Real and complex zeros, factor structure, and the fundamental theorem of algebra.

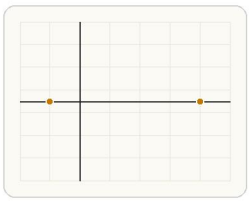
Name _____ Date _____

32 main · 2-up grid · 2 pages

Completion Reward

Shown here as a small pack artifact, not a preview destination.

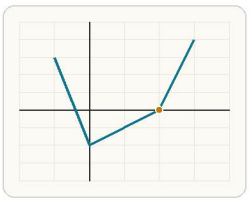
1. If (x - 4)(x + 1) = 0, what values can x take?



A product is zero only when at least one factor is zero, so solve each factor equation.

A. -4 or 1
B. 4 only
C. -1 only
D. 4 or -1

2. If f(2) = 0, what must be true?



If f(2) = 0, the polynomial has a zero at x = 2, so x - 2 is a factor.

A. x + 2 is a factor of f(x).
B. x - 2 is a factor of f(x).
C. The polynomial is linear.
D. x = 2 cannot be an x-intercept.

3. What is i^2 equal to?

power	value
i^1	i
i^2	-1
i^3	-i
i^4	1

The powers of i cycle because i^2 = -1, i^3 = -i, and i^4 = 1 before the pattern repeats.

A. 1
B. i
C. -i
D. -1

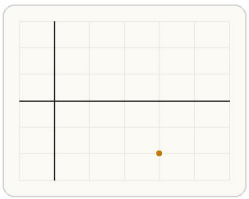
4. What does the Fundamental Theorem of Algebra guarantee for a degree-3 polynomial?

degree	complex roots
1	1
2	2
3	3

The Fundamental Theorem of Algebra says a degree-n polynomial has n complex roots when multiplicity is counted.

A. It has 3 complex roots counting multiplicity.
B. It has exactly 3 real roots.
C. It must factor only over integers.
D. It has no repeated roots.

5. Which expression is written in a + bi form?



In a + bi form, the real part is horizontal and the imaginary part is vertical.

A. 3 - 2i
B. sqrt(5)
C. x^2 + 1
D. 1 / 3

6. If x = -4 is a zero, which factor must appear?

A. x + 4
B. x - 4
C. 4x
D. x^2 - 4

7. For f(x) = x^2 - 9, which value is a zero?

A. 3
B. 2
C. 1
D. 0

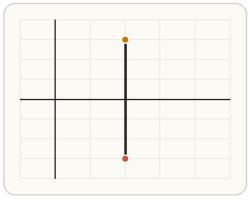
8. If 5 is a zero, which factor belongs?

A. x + 5
B. 5x
C. x - 5
D. x^2 - 5

9. Which expression equals i^5?

A. -i
B. 1
C. i
D. -1

10. Which pair are complex conjugates?



Conjugates keep the same real part and mirror across the horizontal axis.

A. 2 + 3i and -2 + 3i
B. 2 + 3i and 3 + 2i
C. 2 + 3i and 2 - 3i
D. 2 + 3i and -2 - 3i

11. If you know x = 3 is a zero of a polynomial, what is a useful next step?

A. Write the factor x - 3.
B. Write the factor x + 3.
C. Replace every x with 0.
D. Assume the polynomial is quadratic.

12. A student says if (x - 2)(x + 5) = 0, then x = 7. What is the mistake?

A. They should have multiplied 2 and 5 first.
B. They added the factors instead of setting each factor equal to 0.
C. They should square both factors.
D. The equation has no solution.

13. For f(x) = x^2 - 5x + 6, find f(2). Answer with a number.

14. For f(x) = x^3 - x, find f(1). Answer with a number.

15. Find (3 + 2i) + (4 - 5i). Answer in standard form.

16. Find (6 - i) - (2 + 4i). Answer in standard form.

17. Find i(4 - 3i). Answer in standard form.

18. Find i^7. Answer as a simplified complex number.

19. Solve x^2 + 1 = 0. Answer in the form x = ...

20. For p(x) = x^2 + x - 6, find p(2). Answer with a number.

21. Write a polynomial in factored form with zeros 2 and -3. Answer as an equation.

22. Write a polynomial in standard form with zeros 1 and 4. Answer as an equation.

23. Solve (x + 2)(x - 7) = 0. Answer with all solution values of x.

24. Solve x^2 + 4 = 0. Answer in the form x = ...

25. Simplify (3 + i)(3 - i). Answer with a number.

26. Simplify -5i^2. Answer with a number.

27. Find i^10. Answer as a simplified complex number.

28. Write factor form for a polynomial with roots 2 and 2. Answer as an equation.

29. Solve x(x - 1)(x + 2) = 0. Answer with all solution values of x.

30. For p(x) = x^3 - 8, find p(2). Answer with a number.

31. Write factor form for roots -1, -1, and 3. Answer as an equation.

32. Solve x^2 + 9 = 0. Answer in the form x = ...