

7-5

Practice

Roots and Zeros

Solve each equation. State the number and type of roots.

1. $-9x - 15 = 0$

$-5/3, 1 \text{ real}$

2. $x^4 - 5x^2 + 4 = 0$

$-1, 1, -2, 2, 4 \text{ real}$

3. $x^5 = 81x$

$0, -3, 3, -3i, 3i$
3 real, 2 imaginary

4. $x^3 + x^2 - 3x - 3 = 0$

$-1, -\sqrt{3}, \sqrt{3}, 3 \text{ real}$

5. $x^3 + 6x + 20 = 0$

$-2, 1 \pm 3i$
1 real, 2 imaginary

6. $x^4 - x^3 - x^2 - x - 2 = 0$

$2, -1, -i, i, 2 \text{ real}$
2 imaginary

State the possible number of positive real zeros, negative real zeros, and imaginary zeros of each function.

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

2 or 0, 1, 2 or 0

8. $p(x) = 2x^4 - 2x^3 + 2x^2 - x - 1$

3 or 1; 1; 2 or 0

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

2 or 0, 2 or 0, 4, 2, 0

10. $h(x) = 7x^4 + 3x^3 - 2x^2 - x + 1$

2 or 0; 2 or 0; 4, 2 or 0

Find all the zeros of each function.

11. $h(x) = 2x^3 + 3x^2 - 65x + 84$

$-7, 3/2, 4$

12. $p(x) = x^3 - 3x^2 + 9x - 7$

$1, 1 + i\sqrt{6}, 1 - i\sqrt{6}$

13. $h(x) = x^3 - 7x^2 + 17x - 15$

$3, 2 + i, 2 - i$

14. $q(x) = x^4 + 50x^2 + 49$

$-i, i, -7i, 7i$

15. $g(x) = x^4 + 4x^3 - 3x^2 - 14x - 8$

$-1, -7, 2, -4$

16. $f(x) = x^4 - 6x^3 + 6x^2 + 24x - 40$

$-2, 2, 3 - i, 3 + i$

Write a polynomial function of least degree with integral coefficients that has the given zeros.

17. $-5, 3i$

$f(x) = x^3 + 5x^2 + 9x + 45$

18. $-2, 3 + i$

$f(x) = x^3 - 4x^2 - 2x + 20$

19. $-1, 4, 3i$

$f(x) = x^4 - 3x^3 + 5x^2 - 27x - 36$

20. $2, 5, 1 + i$

$f(x) = x^4 - 9x^3 + 26x^2 - 34x + 20$

21. **CRAFTS** Stephan has a set of plans to build a wooden box. He wants to reduce the volume of the box to 105 cubic inches. He would like to reduce the length of each dimension in the plan by the same amount. The plans call for the box to be 10 inches by 8 inches by 6 inches. Write and solve a polynomial equation to find out how much Stephen should take from each dimension.

$(10-x)(8-x)(6-x) = 105, 3 \text{ in}$