3-6 Additional Practice

Theorems About Roots of Polynomial Equations

List all the possible rational solutions for each equation.

1. $2x^2 + 5x + 3 = 0$

   $\pm 1, \pm 3, \pm\frac{1}{2}, \pm\frac{3}{2}$

2. $2x^4 - 18x^2 + 5 = 0$

   $\pm 1, \pm 5, \pm\frac{1}{2}, \pm\frac{5}{2}$

3. $4x^3 - 12x + 9 = 0$

   $\pm 1, \pm 3, \pm 9, \pm\frac{1}{2}, \pm\frac{3}{2}, \pm\frac{9}{2}, \pm\frac{1}{4}, \pm\frac{3}{4}, \pm 9$

List all the real and complex roots of each of the following functions.

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

   $-2, \frac{1 + i\sqrt{3}}{2}, \frac{1 - i\sqrt{3}}{2}$

5. $x^3 - 2x^2 + 4x - 8 = 0$

   $-2, 2i, -2i$

6. $x^5 - 3x^4 - 8x^3 - 8x^2 - 9x - 5 = 0$

   $5, -1, i, -i$

7. What is the equation of a quadratic function P with rational coefficients that has a zero of $3 + 7i$?

   $x^2 - 6x - 40$

8. What is the equation of a polynomial function, R, with rational coefficients that have a zero of $4 + \sqrt{5}$ and $3i$?

   $x^4 - 8x^3 + 20x^2 - 72x + 99$

9. A section of roller coaster can be modeled by the function: $f(x) = x^5 - 5x^4 - 31x^3 + 113x^2 + 282x - 360$. A walkway bridge will be placed at one of the zeros. What are the possible locations for the walkway bridge?

   $-4, -3, 1, 5, 6$

10. A shed in the shape of a rectangular prism measures x feet high, $x + 6.5$ feet wide, and is $x - 4$ feet deep. The volume of the shed is given by the function $v(x) = x^2 + 2.5x - 26$. What is the height, width, and depth of the shed, in feet, if the volume is 990 ft^3?

    height– 10 feet width– 16.5 feet depth– 6 feet

11. Suppose a cubic polynomial, f, has two rational roots c and d and one irrational root which is a conjugate pair $a + \sqrt{b}$, where a and b are rational numbers. Does f have rational coefficients? Explain.

    No, the function has two irrational coefficients.