Name_____ Class _____ Date _____

5-5 Practice

From G

Theorems About Roots of Polynomial Equations

Use the Rational Root Theorem to list all possible rational roots for each equation. Then find any actual rational roots.

1. $x^3 + 5x^2 - 2x - 15 = 0$

2. $36x^3 + 144x^2 - x - 4 = 0$

3. $2x^3 + 5x^2 + 4x + 1 = 0$

4. $12x^4 + 14x^3 - 5x^2 - 14x - 4 = 0$

5. $5x^3 - 11x^2 + 7x - 1 = 0$

6. $x^3 + 81x^2 - 49x - 49 = 0$

A polynomial function $P(x)$ with rational coefficients has the given roots. Find two additional roots of $P(x) = 0$.

7. $2 + 3i$ and $\sqrt{7}$

8. $3 - \sqrt{2}$ and $1 + \sqrt{3}$

9. $-4i$ and $6 - i$

10. $5 - \sqrt{6}$ and $-2 + \sqrt{10}$

11. $\sqrt{5}$ and $-\sqrt{13}$

12. $1 - \sqrt{10}$ and $2 + \sqrt{2}$

Write a polynomial function with rational coefficients so that $P(x) = 0$ has the given roots.

13. 4 and 6

14. -5 and -1

15. $3i$ and $\sqrt{6}$

16. $2 + i$ and $1 - \sqrt{5}$

17. -5 and $3i$

18. i and $5i$

What does Descartes' Rule of Signs say about the number of positive real roots and negative real roots for each polynomial function?

19. $P(x) = 3x^3 + x^2 - 8x - 12$

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

21. $P(x) = 4x^5 - x^4 - x^3 + 6x^2 - 5$

22. $P(x) = x^3 + 4x^2 + x - 6$

Name_____ Class _____ Date_____

5-5 Practice (continued) Form G

Theorems About Roots of Polynomial Equations

Find all rational roots for $P(x) = 0$.

23. $P(x) = x^3 - 5x^2 + 2x + 8$

24. $P(x) = x^3 + x^2 - 17x + 15$

25. $P(x) = 2x^3 + 13x^2 + 17x - 12$

26. $P(x) = x^3 - x^2 - 34x - 56$

27. $P(x) = x^3 - 18x + 27$

28. $P(x) = x^4 - 5x^2 + 4$

29. $P(x) = x^3 - 6x^2 + 13x - 10$

30. $P(x) = x^3 - 5x^2 + 4x + 10$

31. $P(x) = x^3 - 5x^2 + 17x - 13$

32. $P(x) = x^3 + x + 10$

33. $P(x) = x^3 - 5x^2 - x + 5$

34. $P(x) = x^3 - 12x + 16$

35. $P(x) = x^3 - 2x^2 - 5x + 6$

36. $P(x) = x^3 - 8x^2 - 200$

37. $P(x) = x^3 + x^2 - 5x + 3$

38. $P(x) = 4x^3 - 12x^2 - x + 3$

39. $P(x) = x^3 + x^2 - 7x + 2$

40. $P(x) = 12x^3 + 31x^2 - 17x - 6$

Write a polynomial function $P(x)$ with rational coefficients so that $P(x) = 0$ has the given roots.

41. $\sqrt{3}, 2, -i$

42. $5, 2i$

43. $-1, 3 + I$

44. $-\sqrt{7}, i$

45. $-4, 4i$

46. $6, 3 - 2i$

47. Error Analysis A student claims that $2i$ is the only imaginary root of a polynomial equation that has real coefficients. Explain the student's mistake.

48. You are building a rectangular sandbox for a children's playground. The width of the sandbox is 4 times its height. T e length of the sandbox is 8 ft more than 2 times its height. You have 40 ft^3 of sand available to fill this sandbox. What are the dimensions of the sandbox?

49. Writing According to the Rational Root Theorem, what is the relationship between the polynomial equation $2x^4 - x^3 - 7x^2 + 5x + 3 = 0$ and rational roots of the form $\frac{p}{q}$, where $\frac{p}{q}$ is in simplest form?