Name_____ Class_____ Date_____

5-5 Practice

Form K

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. $x^3 - 5x^2 + 17x - 13$

To start, list the constant term's factors and the leading coefficient's factors.

constant term factors: $\pm 1, \pm 13$

leading coefficient factors: ± 1

2. $2x^3 - 5x^2 + x - 7$

3. $x^3 - 4x^2 - 15x + 18$

4. $x^3 - 8x^2 - 2$

5. $x^3 - x^2 + 6x - 6$

6. $4x^3 + 12x^2 + x + 3$

7. $x^3 - 3x^2 - 16x - 12$

8. $x^3 + 8x^2 - x - 8$

9. $x^3 - 3x^2 - 24x - 28$

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

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

11. $P(x) = x^4 - 4x^3 - 13x^2 + 4x + 12$

12. $P(x) = x^3 + 14x^2 + 53x + 40$

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

14. $P(x) = x^3 + 5x^2 - 9x - 45$

15. $P(x) = x^3 + 9x^2 - x - 9$

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

17. $P(x) = x^3 - 7x^2 + 14x - 8$

Name_____ Class _____ Date_____

5-5 Practice (continued) *Form K*

Theorems About Roots of Polynomial Equations

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

18. $1 + 4i$ and $\sqrt{3}$

19. $3 - \sqrt{2}$ and $1 + \sqrt{3}$

20. $-8i$ and $7 - i$

21. $6 - \sqrt{7}$ and $-3 + \sqrt{10}$

22. $\sqrt{2}$ and $-\sqrt{13}$

23. $1 - \sqrt{3}$ and $1 + \sqrt{2}$

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

24. $3i$

To start, use the Conjugate Root Theorem to identify a second root.

Since $3i$ is a root, $-3i$ is also a root.

25. -2 and -8

26. 4 and 1

27. $2i$ and $\sqrt{2}$

28. $3 + i$ and $1 - \sqrt{3}$

29. -4 and $5i$

30. $2i$ and i

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

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

To start, count and identify the number of sign changes in $P(x)$.

There are 2 sign changes in $P(x)$.

So there are 0 or 2 positive real roots.

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

33. $P(x) = x^4 - 3x^3 - x + 5$