

Rational Roots Theorem and Factoring/Solving 3

Date _____ Period _____

State the possible rational zeros for each function. Then factor each and find all zeros.

1) $f(x) = 5x^3 - 11x^2 + 7x - 1$

2) $f(x) = 3x^3 + 11x^2 + 5x - 3$

3) $f(x) = 2x^3 + 9x^2 - 2x - 33$

4) $f(x) = x^3 - 3x^2 - 14x + 12$

5) $f(x) = 2x^3 - 23x^2 - 16x - 2$

6) $f(x) = 4x^3 - x^2 - 4x + 1$

$$7) f(x) = x^3 - x^2 - 15x - 18$$

$$8) f(x) = x^3 + 9x^2 - 21x - 2$$

$$9) f(x) = 5x^4 + 9x^3 + 3x^2 - x$$

$$10) f(x) = x^4 + 6x^3 + 6x^2 - 4x$$

$$11) f(x) = 2x^5 - 4x^4 - 7x^3 + 14x^2 + 6x - 12$$

$$12) f(x) = 5x^5 - 15x^4 - 4x^3 + 12x^2 - 9x + 27$$

Answers to Rational Roots Theorem and Factoring/Solving 3 (ID: 1)

1) Possible rational zeros: $\pm 1, \pm \frac{1}{5}$

Factors to: $f(x) = (5x - 1)(x - 1)^2$

Zeros: $\left\{ \frac{1}{5}, 1 \text{ mult. } 2 \right\}$

3) Possible rational zeros:

$\pm 1, \pm 3, \pm 11, \pm 33, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{11}{2}, \pm \frac{33}{2}$

Factors to: $f(x) = (x + 3)(2x^2 + 3x - 11)$

Zeros: $\left\{ -3, \frac{-3 + \sqrt{97}}{4}, \frac{-3 - \sqrt{97}}{4} \right\}$

5) Possible rational zeros: $\pm 1, \pm 2, \pm \frac{1}{2}$

Factors to: $f(x) = (2x + 1)(x^2 - 12x - 2)$

Zeros: $\left\{ -\frac{1}{2}, 6 + \sqrt{38}, 6 - \sqrt{38} \right\}$

7) Possible rational zeros: $\pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18$

Factors to: $f(x) = (x + 2)(x^2 - 3x - 9)$

Zeros: $\left\{ -2, \frac{3 + 3\sqrt{5}}{2}, \frac{3 - 3\sqrt{5}}{2} \right\}$

9) Possible rational zeros: 0

Factors to: $f(x) = x(5x - 1)(x + 1)^2$

Zeros: $\left\{ 0, \frac{1}{5}, -1 \text{ mult. } 2 \right\}$

11) Possible rational zeros:

$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12, \pm \frac{1}{2}, \pm \frac{3}{2}$

Factors to: $f(x) = (x - 2)(x^2 - 2)(2x^2 - 3)$

Zeros: $\left\{ 2, \sqrt{2}, -\sqrt{2}, \frac{\sqrt{6}}{2}, -\frac{\sqrt{6}}{2} \right\}$

2) Possible rational zeros: $\pm 1, \pm 3, \pm \frac{1}{3}$

Factors to: $f(x) = (3x - 1)(x + 3)(x + 1)$

Zeros: $\left\{ \frac{1}{3}, -3, -1 \right\}$

4) Possible rational zeros: $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

Factors to: $f(x) = (x + 3)(x^2 - 6x + 4)$

Zeros: $\left\{ -3, 3 + \sqrt{5}, 3 - \sqrt{5} \right\}$

6) Possible rational zeros: $\pm 1, \pm \frac{1}{2}, \pm \frac{1}{4}$

Factors to: $f(x) = (x + 1)(4x - 1)(x - 1)$

Zeros: $\left\{ -1, \frac{1}{4}, 1 \right\}$

8) Possible rational zeros: $\pm 1, \pm 2$

Factors to: $f(x) = (x - 2)(x^2 + 11x + 1)$

Zeros: $\left\{ 2, \frac{-11 + 3\sqrt{13}}{2}, \frac{-11 - 3\sqrt{13}}{2} \right\}$

10) Possible rational zeros: 0

Factors to: $f(x) = x(x + 2)(x^2 + 4x - 2)$

Zeros: $\left\{ 0, -2, -2 + \sqrt{6}, -2 - \sqrt{6} \right\}$

12) Possible rational zeros:

$\pm 1, \pm 3, \pm 9, \pm 27, \pm \frac{1}{5}, \pm \frac{3}{5}, \pm \frac{9}{5}, \pm \frac{27}{5}$

Factors to: $f(x) = (x - 3)(5x^2 - 9)(x^2 + 1)$

Zeros: $\left\{ 3, \frac{3\sqrt{5}}{5}, -\frac{3\sqrt{5}}{5}, i, -i \right\}$