

5.1: Rational Root Theorem

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

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

2) $f(x) = 2x^3 - 6x^2 - 45x - 27$

3) $f(x) = 2x^3 - 5x^2 + 4x - 1$

4) $f(x) = 3x^3 - 25x^2 - 44x + 10$

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

$$6) f(x) = 5x^3 + 31x^2 + 31x + 5$$

$$7) f(x) = 2x^3 - 9x^2 + x + 18$$

$$8) f(x) = 5x^3 - 31x^2 + 31x - 5$$

$$9) f(x) = x^3 + 11x^2 + 13x - 10$$

$$10) f(x) = 2x^3 + 14x^2 + 21x - 9$$

$$11) f(x) = 4x^4 + 4x^3 - x^2 - x$$

$$12) f(x) = x^4 + 6x^3 - 7x^2 - 18x$$

Answers to 5.1: Rational Root Theorem (ID: 1)

- 1) Possible rational zeros: $\pm 1, \pm 2, \pm \frac{1}{2}$
Factors to: $f(x) = (2x - 1)(x - 2)(x + 1)$
Rational zeros: $\left\{\frac{1}{2}, 2, -1\right\}$
- 5) Possible rational zeros: $\pm 1, \pm \frac{1}{2}$
Factors to: $f(x) = (2x + 1)(x + 1)(x - 1)$
Rational zeros: $\left\{-\frac{1}{2}, -1, 1\right\}$
- 9) Possible rational zeros: $\pm 1, \pm 2, \pm 5, \pm 10$
Factors to: $f(x) = (x + 2)(x^2 + 9x - 5)$
Rational zeros: $\{-2\}$
- 3) Possible rational zeros: $\pm 1, \pm \frac{1}{2}$
Factors to: $f(x) = (x - 1)^2(2x - 1)$
Rational zeros: $\left\{1 \text{ mult. } 2, \frac{1}{2}\right\}$
- 7) Possible rational zeros:
 $\pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{9}{2}$
Factors to: $f(x) = (x - 2)(2x^2 - 5x - 9)$
Rational zeros: $\{2\}$
- 11) Possible rational zeros: $0, \pm 1, \pm \frac{1}{2}, \pm \frac{1}{4}$
Factors to: $f(x) = x(x + 1)(2x + 1)(2x - 1)$
Rational zeros: $\left\{0, -1, -\frac{1}{2}, \frac{1}{2}\right\}$