

**Rational Root Theorem**

Given $a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \dots + a_nx^0 = 0$.

Let a_0 and a_n be nonzero. Then each rational solution x can be written in the form $x = \pm \frac{p}{q}$ for p

and q satisfying two properties:

1. p is an integer factor of a_0 , and
2. q is an integer factor of the coefficient a_n .

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

a. Possible values of p : _____ q : _____

b. Possible values of q : _____

c. Possible values of $\pm \frac{p}{q}$: _____

d. Values of $\pm \frac{p}{q}$ for which the function value is zero: _____

e. Zero(s) from the graph: _____

f. Considering both the spreadsheet and the graph, zeros or roots are identified by...

g. Rational roots of $f(x) = 3x^3 - 5x^2 + 5x - 2$: _____

2. **Given** $f(x) = x^4 + 2x^3 - 7x^2 - 8x + 12$

a. Possible values of p : _____ q : _____

b. Possible values of $\pm \frac{p}{q}$: _____

c. Values of $\pm \frac{p}{q}$ for which the function value is zero: _____

d. Zero(s) from the graph: _____

e. Rational roots of $f(x) = x^4 + 2x^3 - 7x^2 - 8x + 12$: _____



Rational Roots of Polynomial Functions

3. **Given** $(x) = 2x^4 + x^3 - 31x^2 - 26x + 24$

a. Possible values of p : _____ q : _____

b. Possible values of $\pm \frac{p}{q}$: _____

c. Values of $\pm \frac{p}{q}$ for which the function value is zero: _____

d. Rational zero(s) from the graph: _____

e. Rational roots of $(x) = 2x^4 + x^3 - 31x^2 - 26x + 24$: _____

f. Does the graph show any zeros that are irrational? Explain how you determined this.

g. How do you distinguish the irrational real zeros from the rational real zeros for a given polynomial?

h. Identify any irrational real zeros for the polynomial: _____

i. Why does it make sense that irrational roots exist as conjugate pairs? *Hint: Think of a formula for determining the zeros of quadratic functions.*



Rational Roots of Polynomial Functions

4. **Given** $f(x) = 6x^4 - 11x^3 + 8x^2 - 33x - 30$

a. Possible values of p: _____ q: _____

b. Possible values of $\pm \frac{p}{q}$: _____

c. Values of $\pm \frac{p}{q}$ for which the function value is zero: _____

d. Zero(s) from the graph: _____

e. Rational roots of $f(x) = 6x^4 - 11x^3 + 8x^2 - 33x - 30$: _____