

Section 4-5 Locating Zeros of a Polynomial Function

Even with the Rational Root Theorem and Descartes Rule of Signs, the location of some roots is not possible. When roots are real, but irrational, these techniques fail to locate the missing roots.

The Location Principle helps to locate these irrational, real roots:

Location Principle - Suppose $y = f(x)$ represents a polynomial function with real coefficients. If a and b are two numbers with $f(a)$ negative and $f(b)$ positive, the function has at least one real zero between a and b .

"If $f(a) > 0$ and $f(b) < 0$, then the function also has at least one real zero between a and b ."

Ex. $f(x) = x^3 - 4x^2 - 2x + 8$

3 roots

2 or 0 (+) real roots

1 (-) real root

$$\frac{p}{q} = \pm 8, \pm 4, \pm 2, \pm 1$$

By inspection, using +8 is a large (+) #. using (-8) is a large (-) #. Check integer values between -4 and +4.

x	1	-4	-2	8
-4	1	-8	30	-112
-3	1	-7	19	-49
-2	1	-6	10	-12
-1	1	-5	3	5
0	1	-4	-2	8
1	1	-3	-5	3
2	1	-2	-6	-4
3	1	-1	-5	-7
4	1	0	-2	0

Sign change (root between -2 & -1)

Sign change (root between 1 & 2)

← root

