

Graphing Polynomials and Tracing to Find the Roots

A polynomial $y = f(x)$ is an expression of the sums of several terms that contain different powers of the same originals. The roots are found at the intersection of the x -axis and the graph, i. e. when $y = 0$.

Example

Draw a graph of a polynomial and approximate the roots by using the Zoom-in and Trace features.

1. Graph the polynomial $y = x^3 - 3x^2 + x + 1$.
2. Approximate the left-hand root.
3. Approximate the middle root.
4. Approximate the right-hand root.

Before Starting There may be differences in the results of calculations and graph plotting depending on the setting. Return all settings to the default value and delete all data.

Set the zoom to the decimal window: ZOOM A (ENTER ALPHA ▼) 7 *

Setting the zoom factors to 5 : ZOOM B * ENTER 5 ENTER 5 ENTER 2nd F QUIT

Step & Key Operation

Display

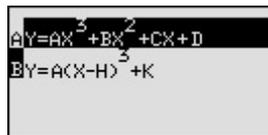
Notes

*Use either pen touch or cursor to operate.

- 1-1** Enter the polynomial
 $y = x^3 - 3x^2 + x + 1$.

Y= EZ

5 * ENTER * ENTER * ENTER *

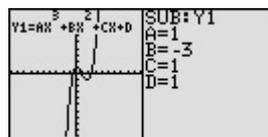


- 1-2** Enter the coefficients.

2nd F SUB

1 ENTER * (-) 3 ENTER *

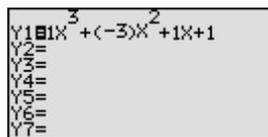
1 ENTER * 1 ENTER



It may take few seconds for the graph to be drawn. Enter each coefficients when the cursor is displayed.

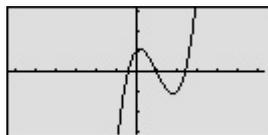
- 1-3** Return to the equation display screen.

2nd F EXE



- 1-4** View the graph.

GRAPH



Step & Key Operation

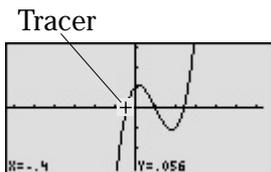
Display

Notes

*Use either pen touch or cursor to operate.

2-1 Move the tracer near the left-hand root.

TRACE ◀* (repeatedly)



Note that the tracer is flashing on the curve and the x and y coordinates are shown at the bottom of the screen.

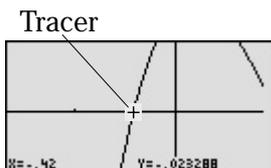
2-2 Zoom in on the left-hand root.

ZOOM A* 3*



2-3 Move the tracer to approximate the root.

TRACE ◀* OR ▶* (repeatedly)



The root is : $x \doteq -0.42$

3-1 Return to the previous decimal viewing window.

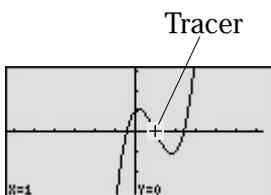
ZOOM H*

2*



3-2 Move the tracer to approximate the middle root.

TRACE ▶* (repeatedly)



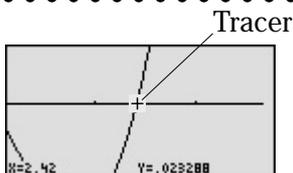
The root is exactly $x = 1$. (Zooming is not needed to find a better approximate.)

4 Move the tracer near the right-hand root. Zoom in and move the tracer to find a better approximate.

▶* (repeatedly)

ZOOM A* 3*

TRACE ▶* OR ◀* (repeatedly)



The root is : $x \doteq 2.42$

The calculator allows the roots to be found (or approximated) visually by graphing a polynomial and using the Zoom-in and Trace features.