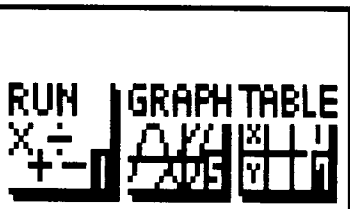


HHHMMMM!

Functions
Tables
Discovery
Factoring
Asymptote

Standards: Problem Solving, Communication, Reasoning, Algebra, and Functions.

Materials: *CFX-9850G or CFX-9850Ga PLUS*

Calculator Menus: RUN, GRAPH, and TABLE

Setting the V-Window to the Standard Setting (STD)

Press SHIFT key
F3 (V-Window)
F3 (STD)
EXIT key

Setting the V-Window to the Initial Setting (INIT)

Press SHIFT key
F3 (V-Window)
F1 (INIT)
EXIT key

Resizing the Graph Window

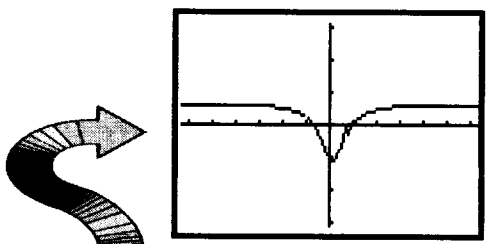
Press Shift key
F3 (V-WIN)
Highlight Xmin, Xmax , Ymin, or Ymax.
Enter desired value
EXE key
Repeat steps to alter min or max values for X or Y.

At times, functions appear to do some very strange things. Current tools such as computer software and graphing calculators may appear to give false information. We can harness the power of technology to answer questions which, on the surface, may provide one indicator when there is something entirely different occurring.

Define a relation. **A.**

Define a function. **B.**

Set the V-Window to either INIT or STD.



Graph the function $\frac{2x^4 - 3x^2 + 1}{3x^4 - x^2 + x - 1}$ in Y1.

Describe the graph. **C.**

Resize the V-Window so that the range of both X and Y is between -2 and 2.

Graph the function again. Describe the graph. **D.**

Resize the V-Window so X is between 0.5 and 1 and Y is between -2 and 2.

Graph the function again. Describe the graph. **E.**

Reset the V-Window so X is between 0.7 and 0.8 and Y is between -2 and 2.

Graph the function again. Describe the graph. **F.**

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Factoring the expression $\frac{2x^4 - 3x^2 + 1}{3x^4 - x^2 + x - 1}$ yields $\frac{(x-1)(x+1)(2)(x-\frac{\sqrt{2}}{2})(x+\frac{\sqrt{2}}{2})}{(x+1)(3x^3 - 3x^2 + 2x - 1)}$.

There is a common factor of (X + 1) which indicates that something unusual may occur around the value of X = -1.

Set the view window to the initial setting. Zoom in on the region of the curve around the point where X = -1.

Describe the graph when X = -1. **G.**

Switch to the TABLE Menu. Set the range to begin at -1.1 and end at -0.9 moving at a pitch of 0.1. Create a table for the function.

Describe what the table indicates. **H.**

? Explain any discrepancies discovered between the table and the graph. **I.**

The discrepancy shows why it is important to know what is happening when technology is used as a tool.

Switch to the GRAPH Menu. De-Select the function in Y1.

Set the view window to the initial setting.

Create a new function Y2 = $3X^4 - X^2 + X - 1$ and graph.

Describe the graph. **J.**

A vertical asymptote of the original function is located where the graph of the denominator crosses the X-axis between $0.5 < X < 1$.

Locate or create another function that will result in strange behavior about a given point. **K.**

De-selecting an Equation in the GRAPH Menu

Highlight the equation
Press F1 (SEL)
The = sign will turn blue when de-selected.

Setting the Range in the TABLE Menu

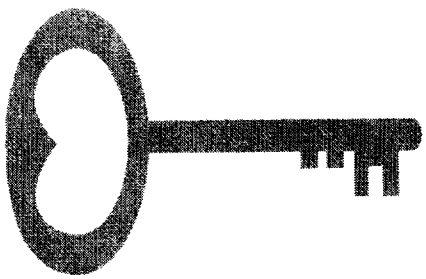
Press F5 (RANG)
Enter value for Start
Press EXE
Enter value for End
Press EXE
Enter value for Pitch
Press EXE
EXIT key
note: Pitch is increment

? represents a high level question

Zooming In on an Area of a Graph

With a graph on the screen:
Press F2 (ZOOM)
F3 (IN)
Repeat to zoom again.

Solution Key



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A. - B. Answers will vary

C. Answers will vary. It looks like a "V" that is symmetric about the Y -axis between -1 and 1. The ends of the "V" get almost flat outside -2 and 2. It might look like some unusual things are happening close to 1.

D. Answers will vary. The graph is not symmetric about the Y-axis. There is a "glitch" in the graph around X = 0.75.

E. Answers will vary. It looks like the Y value drops very fast, very far around X = 0.75 but then it comes back up very fast until it is close to Y = -0.5 when it starts to move off to the right and looks almost horizontal.

F. Answers will vary. The function is not continuous.

G. Answers will vary. The function appears to be continuous.

H. There is not solution at X = -1.

I. There is a discontinuity at X = -1 but the graph will not indicate it. This is a "one point" hole in the curve that cannot be indicated by any technology available today.

J. The graph crosses the X axis in two different places, one of which is between X = 0.5 and X = 1. But, that makes the denominator of the function zero at that point, creating the discontinuity.

K. Answers will vary.