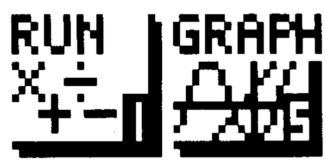


What's Goin' On?

Functions
Cosine
Sine
Identities

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

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

Calculator Menus: RUN and GRAPH

A rather common error for students is to assert that $(X - 3)^2 = X^2 - 9$. Investigation of the situation with the graphing capabilities of the *CFX-9850G* will provide some insight.

Set the graph V-Window at STD.
Enter $(X - 3)^2$ in Y1 and $X^2 - 9$ in Y2. Change the color of Y2 to green and graph.

Describe the graphs. **A.**

Use G-Solv to find the coordinates of the points of intersection. **B.**__________

Enter $X^2 - 6X + 9$ in Y3 and make it orange and graph. Describe the graphs now. **C.**

De-select $Y2 = X^2 - 9$ and graph. Use G-Solv to search for points of intersection and describe the results. **D.**

The work so far shows that $(X - 3)^2$ and $X^2 - 6X + 9$ yield the same graphs and thus are different names for the same thing. In other words, $(X - 3)^2$ and $X^2 - 6X + 9$ are an identity. Notice that this identity has an infinite number of solutions (points in common).

De-select or delete the equations in the calculator, enter and graph Y = X and $Y = \sqrt{X^2}$. Use G-Solv to search for points of intersection and describe the results. **E.**

De-select Y = X and graph Y = |X|, making the absolute value orange. Use G-Solv to search for points of intersection and describe the results. **F.**

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

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

Changing the Color of an Equation and Graph in the GRAPH Menu

Highlight the equation.
Press F4 (COLR)
Select desired color:
F1 (Blue),
F2 (Orng), or
F3 (Grn)
Exit key

Using G-Solv to Find Intersections

Graph the equations
Press F5 (G-Solv)
F3 (V-Window)
F5 (ISCT)

Graphing Absolute Values

In the GRAPH Menu
Press OPTN key
F5 (NUM)
F1 (Abs)
X
EXE
F6 (DRAW)

What's Goin' On?

De-selecting an Equation in the GRAPH Menu

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

? represents a high level question

Deleting an Equation in the GRAPH Menu

Highlight the equation
Press F2 (DEL)
F1 (YES)

This section of work shows that $Y = \sqrt{X^2}$ and Y = |X| yield the same graphs and thus show an identity.

When Y = X is considered, there still will be an infinite number of solutions with either $Y = \sqrt{X^2}$ or Y = |X|, but Y = X is not an identity with either. Why? **G**.

Figure 1 shows the graph of $Y = -\sqrt{X^2}$. What is another expression that will yield the same graph? **H.**

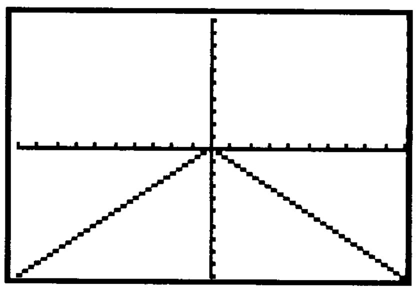


Figure 1

? Figure 2 shows the graph of Y = 0.5 - 0.5(cos(2X)). What is another expression that will yield the same graph? **I.**

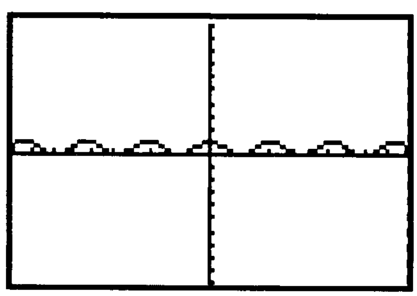
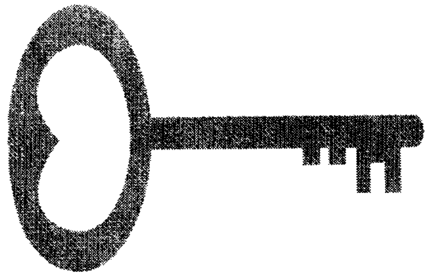


Figure 2

? Give two equations that would be an identity. **J.**

? Give two equations that would not be an identity but which would have an infinite number of points in common. **K.**

Solution Key



What's Goin' On?

A. Two parabolas that intersect in one place.

B. (3, 0)

C. $X^2 - 6X + 9$ graphs on top of $(X - 3)^2$.

D. Since the two graphs are on top of each other, there are an infinite number of solutions. The calculator is showing only some of them.

E. The number of solutions is infinite but they are all in the first quadrant plus the origin. There is also an infinite number of points on $Y = X$ and $Y = \sqrt{X}$ that are not solutions in the second and third quadrants.

F. The number of solutions is infinite. There are no graphed points that are not solutions.

G. Identities must have all points in common.

H. - K. Answers will vary.