



Graphing Calculator Investigation

A Preview of Lesson 14-7

Solving Trigonometric Equations

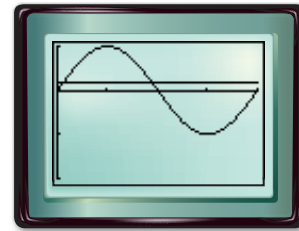
The graph of a trigonometric function is made up of points that represent all values that satisfy the function. To solve a trigonometric equation, you need to find all values of the variable that satisfy the equation. You can use a TI-83 Plus to solve trigonometric equations by graphing each side of the equation as a function and then locating the points of intersection.

Example 1 Use a graphing calculator to solve $\sin x = 0.2$ if $0^\circ \leq x < 360^\circ$.

Rewrite the equation as two functions, $y = \sin x$ and $y = 0.2$. Then graph the two functions. Look for the point of intersection.

Make sure that your calculator is in degree mode to get the correct viewing window.

KEYSTROKES: **MODE** **▼** **▼** **▶** **ENTER** **WINDOW** **0** **ENTER**
360 **ENTER** 90 **ENTER** -2 **ENTER** 1 **ENTER** 1
ENTER **Y=** **SIN** **X,T,θ,n** **ENTER** 0.2 **ENTER**
GRAPH



[0, 360] scl: 90 by [-2, 1] scl: 1

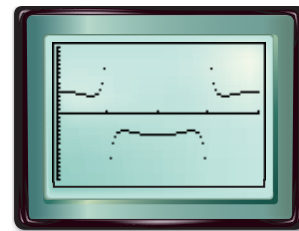
Based on the graph, you can see that there are two points of intersection in the interval $0^\circ \leq x < 360^\circ$. Use **Zoom** or **2nd** **[CALC]** **5** to approximate the solutions. The approximate solutions are 168.5° and 11.5° .

Like other equations you have studied, some trigonometric equations have no real solutions. Carefully examine the graphs over their respective periods for points of intersection. If there are no points of intersection, then the trigonometric equation has no real solutions.

Example 2 Use a graphing calculator to solve $\tan^2 x \cos x + 5 \cos x = 0$ if $0^\circ \leq x < 360^\circ$.

Because the tangent function is not continuous, place the calculator in Dot mode. The related functions to be graphed are $y = \tan^2 x \cos x + 5 \cos x$ and $y = 0$.

These two functions do not intersect. Therefore, the equation $\tan^2 x \cos x + 5 \cos x = 0$ has no real solutions.



[0, 360] scl: 90 by [-15, 15] scl: 1

Exercises

Use a graphing calculator to solve each equation for the values of x indicated.

- $\sin x = 0.8$ if $0^\circ \leq x < 360^\circ$
- $\tan x = \sin x$ if $0^\circ \leq x < 360^\circ$
- $2 \cos x + 3 = 0$ if $0^\circ \leq x < 360^\circ$
- $0.5 \cos x = 1.4$ if $-720^\circ \leq x < 720^\circ$
- $\sin 2x = \sin x$ if $0^\circ \leq x < 360^\circ$
- $\sin 2x - 3 \sin x = 0$ if $-360^\circ \leq x < 360^\circ$

