

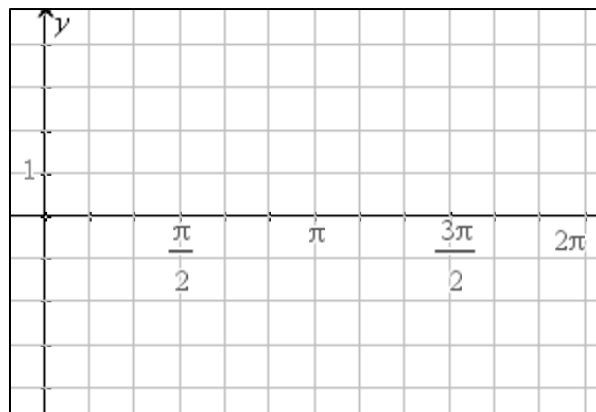
Nspire Activity: It's Getting Crowded!

In this activity you will gain an understanding for how to solve more complex trig equations by investigating solutions to equations graphically.



Part 1: Starting Simple

1. Solve the trig equation $2 = 4\cos(x)$. List all solutions over the interval $[0, 2\pi)$. _____
2. Show the solutions to $2 = 4\cos(x)$ graphically by plotting $y = 2$ and $y = 4\cos(x)$ on the grid below. Mark all solutions/intersections with a ★.



3. Open the document titled 'solutions' and move to page 1.2. You will see the graph of $y = 2$ and $y = 4\cos(ax)$, where 'a' is a value attached to a slider (currently set to 'a' = 1). Use the graph on page 1.2 to check your solutions from above. Then, list your solutions from step #1 (*in numerical order*) in the **first column** of the tables in steps #6 and 8 on the next page.

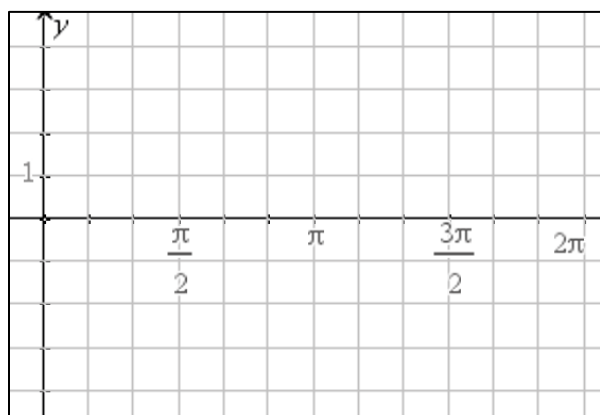
Part 2: Making Connections to Solutions of the equation $2 = 4\cos(2x)$

4. In the next step, you will determine solutions to the equation $2 = 4\cos(2x)$ by observing the intersections of the graphs of $y = 2$ and $y = 4\cos(2x)$. First, answer the questions below.

What is the period of the graph of $y = 4\cos(2x)$? _____

How many cycles of the graph of $y = 4\cos(2x)$ will be seen over the interval $[0, 2\pi)$? _____

5. Change the slider so that the value of 'a' is equal to 2 and list all solutions to the equation displayed over the interval $[0, 2\pi)$ from smallest to largest. Then, make a sketch of the graph, marking all solutions with a ★.



Equation: $2 = 4\cos(2x)$

Solutions: _____

6. List the 1st and 2nd solutions from step #5 (*in order*) in the 2nd column. Then, list the 3rd and 4th solutions (*in order*) from step #5 in the 3rd column.

1 st column	2 nd column	3 rd column
Solutions to $2 = 4\cos(x)$	Solutions to $2 = 4\cos(2x)$	

Compare the corresponding solutions in the 1st and 2nd columns. Explain what you observe.

Compare the corresponding solutions in the 2nd and 3rd columns. Explain what you observe.

What do you think accounts for the observations you made when comparing the solutions?

Part 3: Predicting solutions to the equation $2 = 4\cos(3x)$

7. In the next step, you will predict solutions to the equation $2 = 4\cos(3x)$ and then check them by looking at the intersections of the graphs of $y = 2$ and $y = 4\cos(3x)$. First, answer the questions below.

What is the period of the graph of $y = 4\cos(3x)$? _____

How many cycles of the graph of $y = 4\cos(3x)$ will be seen over the interval $[0, 2\pi)$? _____

8. Using what you have learned in Part 2, predict solutions to the equation of $2 = 4\cos(3x)$. List all solutions and explain how you determined the solutions.

Solutions to $2 = 4\cos(x)$	Solutions to $2 = 4\cos(3x)$		

Explanation: _____

9. Now, change the 'a' slider so that is equal to 3 and observe the solutions to $2 = 4\cos(3x)$ graphically. Compare the actual results to your prediction above.