

Chapter 8 / Example 2

Multiple solutions of trigonometric equations

Use your GDC to find all values of x , $-\pi \leq x \leq 2\pi$ for which:

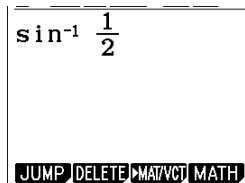
a $\sin x = \frac{1}{2}$

b $\cos x = -0.2$

Press **MENU** 1 **RUN-MAT** to display the Run-Matrix screen for arithmetical calculations.

Press **SHIFT** **sin** (**sin⁻¹**) and type $\frac{1}{2}$.

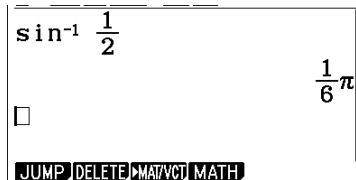
Press **□** to use the fraction template.



The screen displays $\sin^{-1} \frac{1}{2}$. The bottom menu shows JUMP, DELETE, MAT/VCT, and MATH.

Press **EXE**.

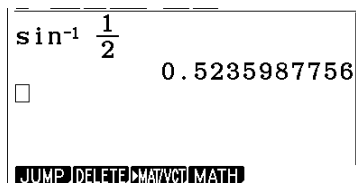
The fx-CG50 displays the result as an exact value.



The screen displays $\sin^{-1} \frac{1}{2} = \frac{1}{6}\pi$. The bottom menu shows JUMP, DELETE, MAT/VCT, and MATH.

Press **S \div D** to display this value as a decimal.

One solution of the equation is $x = 0.524$.



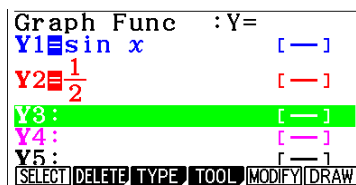
The screen displays $\sin^{-1} \frac{1}{2} = 0.5235987756$. The bottom menu shows JUMP, DELETE, MAT/VCT, and MATH.

To get any remaining values of x in the given domain you must use a graph.

Press **MENU** 5 **GRAPH** to display the equation entry screen.

Type $\sin x$ and press **EXE** to enter the equation as Y1.

Type $1 \div 2$ and press **EXE** to enter the second equation as Y2.



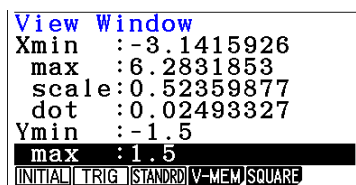
The screen shows the Graph Func entry screen with Y1 = sin x and Y2 = 1/2. The bottom menu shows SELECT, DELETE, TYPE, TOOL, MODIFY, and DRAW.

Press **SHIFT** **F3** V-WIN.

Set the axes to show $-\pi \leq x \leq 2\pi$ and $-1.5 \leq y \leq 1.5$ with an x -scale of $\pi/6$ and a y -scale of 0.5.

You can leave the other items as they are.

Press **EXIT** when you have finished.



The screen shows the View Window settings: Xmin: -3.1415926, max: 6.2831853, scale: 0.52359877, dot: 0.02493327, Ymin: -1.5, max: 1.5. The bottom menu shows INITIAL, TRIG, STANDARD, V-MEM, and SQUARE.

Chapter 8 / Example 2

Multiple solutions of trigonometric equations

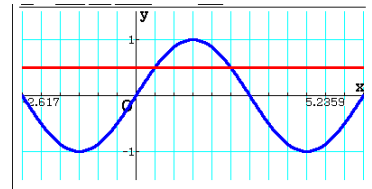
Press **F6** DRAW to display the graph screen

The GDC now displays the curve and the straight-line:

$$Y1 = \sin x$$

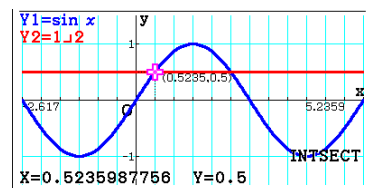
$$Y2 = \frac{1}{2}$$

With the chosen axes.



To find the intersections press **F5** G-SOLVE and then press **F5** INTERSECT.

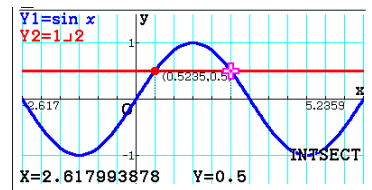
The GDC shows the first intersection at (0.524, 0.5).



Press **EXE** to display the coordinates.

Press **▶** to move to the next intersection and press **EXE** to display its coordinates.

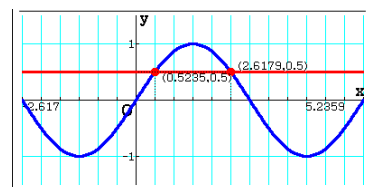
Press **EXIT** to leave G-Solv mode and **F6** DRAW to display the graph screen again.



The GDC now displays the coordinates of both points of intersection.

The points of intersection are (0.524, 0.5) and (2.62, 0.5).

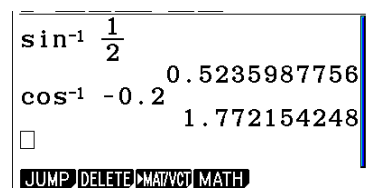
There are two values x for which $\sin x = \frac{1}{2}$: 0.524 and 2.62 correct to three significant figures.



Press **MENU** 1 **RUN-MAT** to display the Run-Matrix screen for arithmetical calculations.

Press **SHIFT** **COS** (\cos^{-1}) and type -0.2 and press **EXE**.

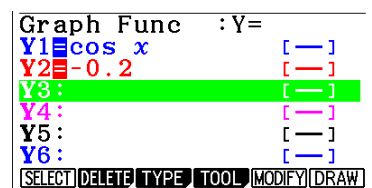
The fx-CG50 displays the result $x = 1.77$.



Press **MENU** 5 **GRAPH** to display the equation entry screen.

Type $\cos x$ and press **EXE** to enter the equation as Y1.

Type -0.2 and press **EXE** to enter the second equation as Y2.



Chapter 8 / Example 2

Multiple solutions of trigonometric equations

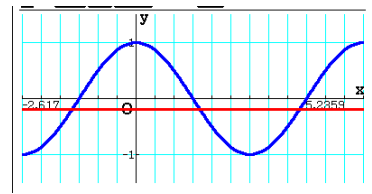
Press **F6** DRAW to display the graph screen

The GDC now displays the curve and the straight-line:

$$Y1 = \cos x$$

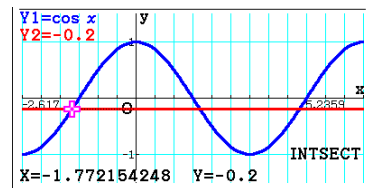
$$Y2 = -0.2$$

With the chosen axes.



To find the intersections press **F5** G-SOLVE and then press **F5** INTERSECT.

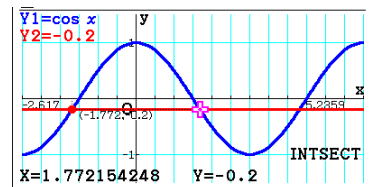
The GDC shows the first intersection at $(-1.77, -0.2)$.



Press **EXE** to display the coordinates.

Press **▶** to move to the other intersections and press **EXE** to display their coordinates.

Press **EXIT** to leave G-Solv mode and **F6** DRAW to display the graph screen again.



The GDC now displays the coordinates of both points of intersection.

The points of intersection are $(-1.77, -0.2)$, $(1.77, -0.2)$ and $(4.51, -0.2)$.

There are three values x for which $\cos x = -0.2$: -1.77 , 1.77 and 4.51 correct to three significant figures.

