

Chapter 6 / Example 32

Trigonometric equations

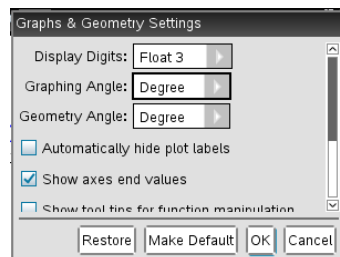
Solve the equation $4\cos \theta - 3\sec \theta = 2\tan \theta$ for $-180^\circ \leq x \leq 180^\circ$.

Open a new document and add a Graphs page.

Press **menu** 9:Settings.

Change Graphing Angle to Degree.

Press **enter**.



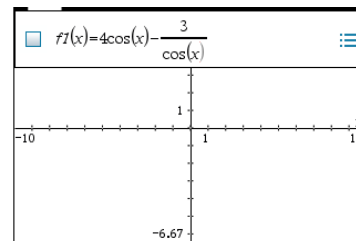
The entry line is displayed at the top of the work area.

The default graph type is function, so 'f1(x)= ' is displayed.

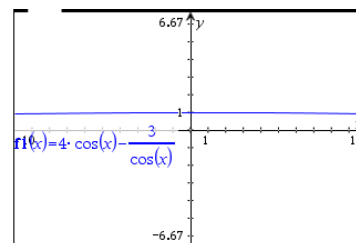
The default axes are $-10 \leq x \leq 10$ and $-6.67 \leq y \leq 6.67$.

Type $4\cos(x) - \frac{3}{\cos(x)}$ and press **enter**.

Press **ctrl** $\left[\frac{\square}{\square}\right]$ to use a fraction template.



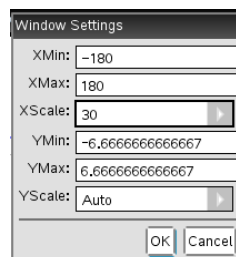
The GDC displays the graph $f1(x) = 4\cos(x) - \frac{3}{\cos(x)}$ with the default axes.



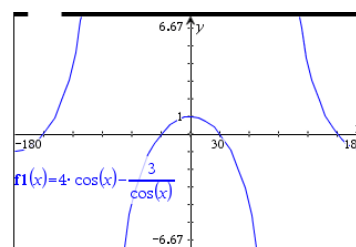
Press **menu** 4:Window/Zoom | 1:Window Settings...

Set the axes to show $-180 \leq x \leq 180$ with a scale of 30 and leave the other items the same.

Press **enter** when you have finished.



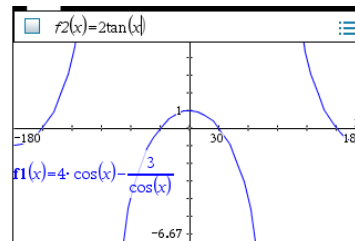
The GDC displays the graph $f1(x) = 4\cos(x) - \frac{3}{\cos(x)}$ for the given domain.



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Press **[tab]** to display the entry line again. This time ' $f2(x)=$ ' is displayed.

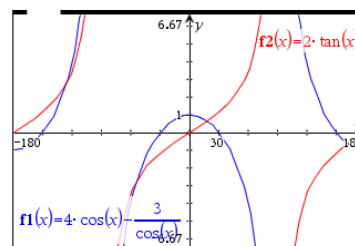
Type $2 \tan(x)$ and press **[enter]**.



The GDC now displays both graphs:

$$f1(x) = 4 \cos(x) - \frac{3}{\cos(x)}$$

$$f2(x) = 2 \tan(x)$$

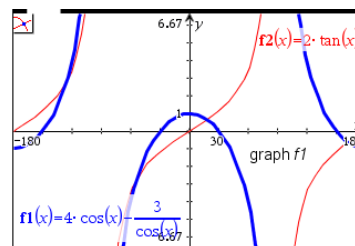


There are two ways to find intersection points. The first is to use **[menu]** 6:Analyse Graph | 4:Intersection. When there is more than one point, however, the following method is quicker.

Press **[menu]** 8:Geometry | 1:Points & Lines | 3: Intersection Point(s)

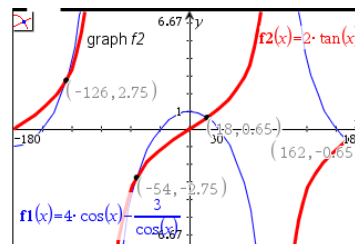
To find the points use the touchpad to highlight the first graph. You will see '*graph f1*' displayed.

Click the touchpad.



Use the touchpad to highlight the second graph. You will see '*graph f2*' displayed.

Click the touchpad.



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

The points of intersection are $(-126, 2.75)$, $(-54, -2.75)$, $(18, 0.65)$ and $(162, -0.65)$.

Therefore, the roots of the equation in the required range are -126° , -54° , 18° , 162° .

