

## Chapter 6 / Example 32

# Trigonometric equations

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

Press **[mode]**.

Use the **[◀]** **[▶]** **[↶]** **[↷]** keys to place the cursor on DEGREE in the Mode menu, and then press **[enter]** to highlight it.

```
MATHPRINT CLASSIC
NORMAL SCI ENG
FLOAT 0 1 2 3 4 5 6 7 8 9
Radian DEGREE
FUNCTION PARAMETRIC POLAR SEQ
THICK DOT-THICK THIN DOT-THIN
SEQUENTIAL SIMUL
REAL a+bi re^(θi)
FULL HORIZONTAL GRAPH-TABLE
FRACTIONTYPE: n/d Un/d
ANSWERS: AUTO DEC FRAC-APPROX
GO TO 2ND FORMAT GRAPH: NO YES
STAT DIAGNOSTICS: OFF ON
STAT WIZARDS: ON OFF
SET CLOCK 09/07/18 8:28PM
```

Press **[f1]** **[y=]** to display the equation entry screen.

Type  $4\cos(x) - \frac{3}{\cos(x)}$  and press **[enter]** to enter the equation as  $Y_1$ .

Type  $2\tan(x)$  and press **[enter]** to enter the equation as  $Y_2$ .

Press **[ALPHA]** **[f1]** 1:n/d to use the fraction template.

```
Plot1 Plot2 Plot3
Y1=4cos(X)-3/cos(X)
Y2=2tan(X)
Y3=
Y4=
Y5=
Y6=
Y7=
```

To change the axes to the domain  $-180 \leq x \leq 180$  press **[f2]** **[window]** and set the axes so that

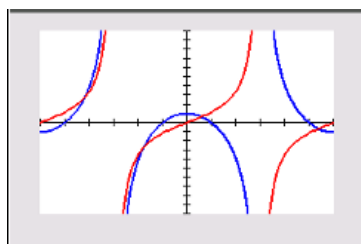
Set Xmin to -180, max to 180 and scale to 30.

You can leave the other items as they are.

```
WINDOW
Xmin=-180
Xmax=180
Xscl=30
Ymin=-10
Ymax=10
Yscl=1
Xres=1
ΔX=1.3636363636364
TraceStep=2.7272727272728
```

Press **[f5]** **[graph]** when you have finished.

The GDC displays the graphs  $Y_1 = 4\cos(x) - \frac{3}{\cos(x)}$  and  $Y_2 = 2\tan(x)$  for the domain  $-180^\circ \leq x \leq 180^\circ$ .

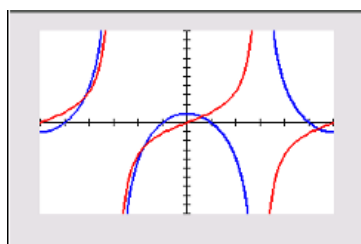


Press **[2nd]** **[f4]** **[calc]** 5:intersect.

To find the intersection you need to choose the two lines that intersect.

The GDC shows a cross on the curve and 'First curve?'.

Press **[enter]**.

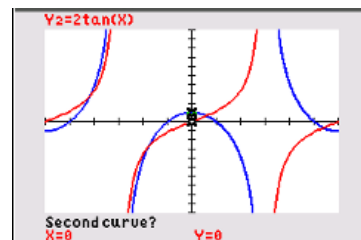


## Chapter 6 / Example 32

# Trigonometric equations

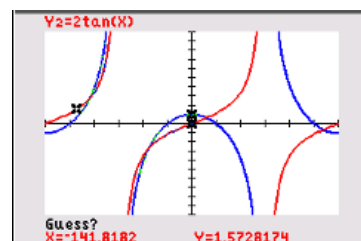
The GDC shows a cross on the line and 'Second curve?'.

Press **enter**.

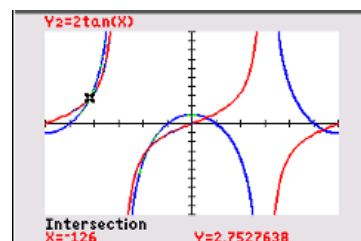


The GDC requires an initial guess for the position of the intersection. Choose a point close to the first intersection by moving the cursor with the **◀ ▶** keys.

Press **enter**.

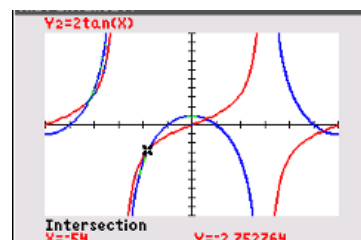


The GDC displays the first intersection at  $(-126, 2.75)$ .



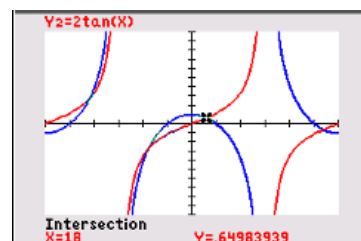
Repeat for the second intersection.

The GDC displays an intersection at  $(-54, -2.75)$ .



Repeat for the third intersection.

The GDC displays an intersection at  $(18, 0.650)$ .



Repeat for the fourth intersection.

The GDC displays an intersection at  $(162, -0.650)$ .

Therefore, the roots of the equation in the required range are  $-126^\circ$ ,  $-54^\circ$ ,  $18^\circ$ ,  $162^\circ$ .

