Title:	SOLVING TRIGONOMETRIC EQUATIONS USING TECHNOLOGY	Date:

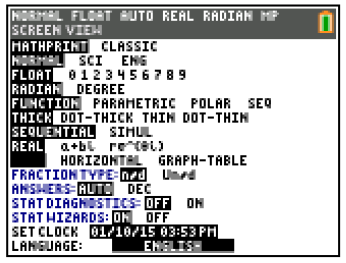
Solving trig equations using GDC.

Trigonometric equations will often have infinitely many solutions unless a restricted domain such as $0 \leqslant x \leqslant 3\pi$ is given.

SOLVING TRIGONOMETRIC EQUATIONS USING TECHNOLOGY

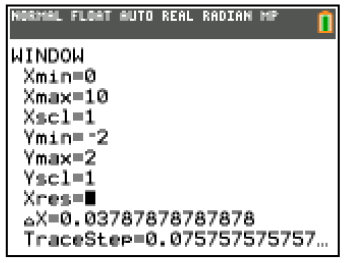
Solve $\cos x = 0.4$ for $0 \leqslant x \leqslant 10$ radians using the graph of $y = \cos x$.

*** Capture 1**



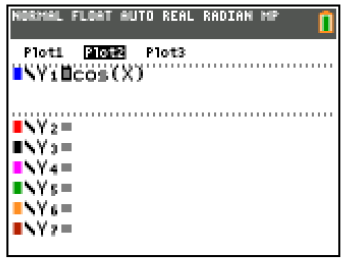
Radians

*** Capture 2**



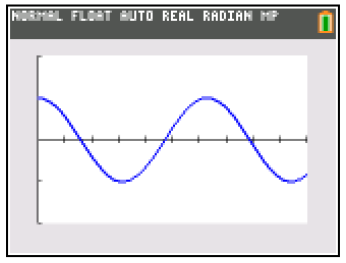
Set up Window

*** Capture 3**



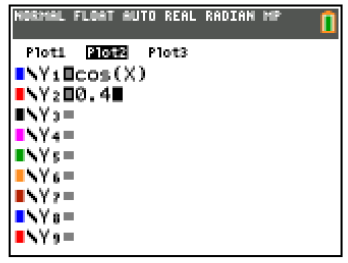
Enter function

*** Capture 4**



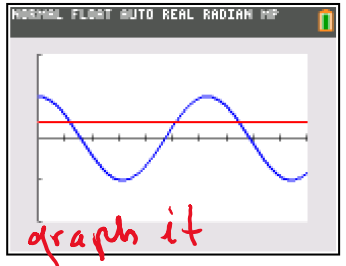
Graph

*** Capture 5**



Enter the right hand side of the equation

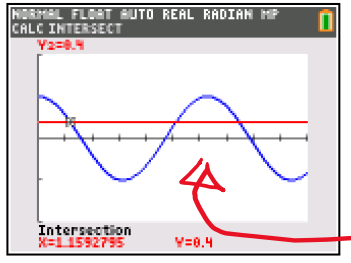
*** Capture 6**



graph it

*** Capture 7**

*** Capture 8**



Find all three intersections.

These x values are the solutions to this equation.

Title:	TRIGONOMETRIC EQUATIONS	Date:

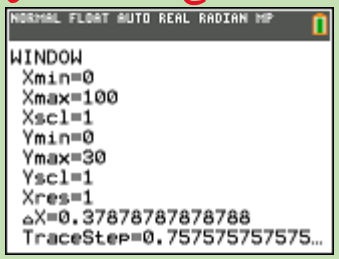
SOLVING TRIGONOMETRIC EQUATIONS USING TECHNOLOGY

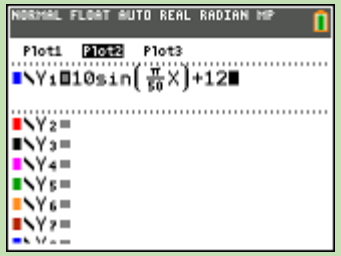
Solve $2\sin x - \cos x = 4 - x$ for $0 \leqslant x \leqslant 2\pi$

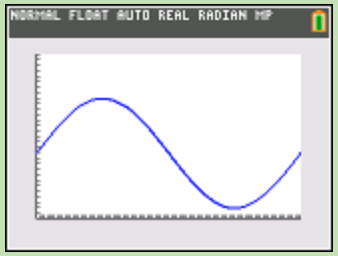
Title:	SOLVING TRIGONOMETRIC EQUATIONS USING TECHNOLOGY

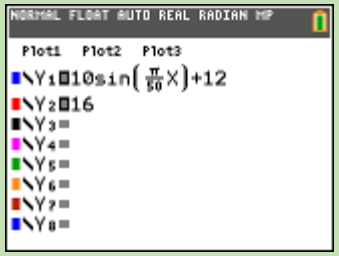
$$10\sin\left(\frac{\pi}{50}t\right) + 12 = 16$$

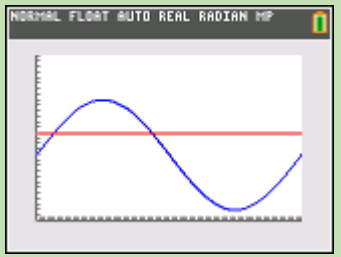
Adjust the domain



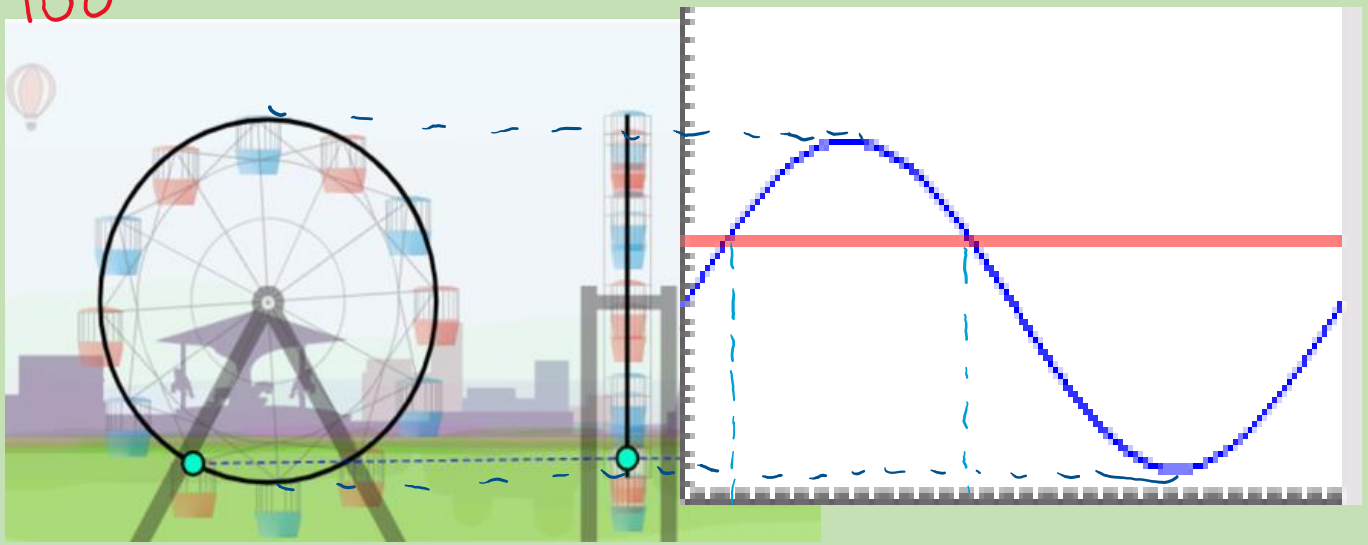








Full revolution is 100



Find the intersections!

Title:	SOLVING TRIGONOMETRIC EQUATIONS USING TECHNOLOGY	Date:

CALCULATOR

5 Solve for θ in the given domain.

GDC

a $\cos\theta = 0.3, -\pi \leq \theta \leq 3\pi$

b $\tan\theta = 1.61, 0 \leq \theta \leq 4\pi$

c $\sin\theta = -2\cos\theta, -\pi \leq \theta \leq \pi$

d $2\tan^2\theta + 5\tan\theta = 3, -2\pi \leq \theta \leq 0$

Title:	TRIGONOMETRIC EQUATIONS	Date:

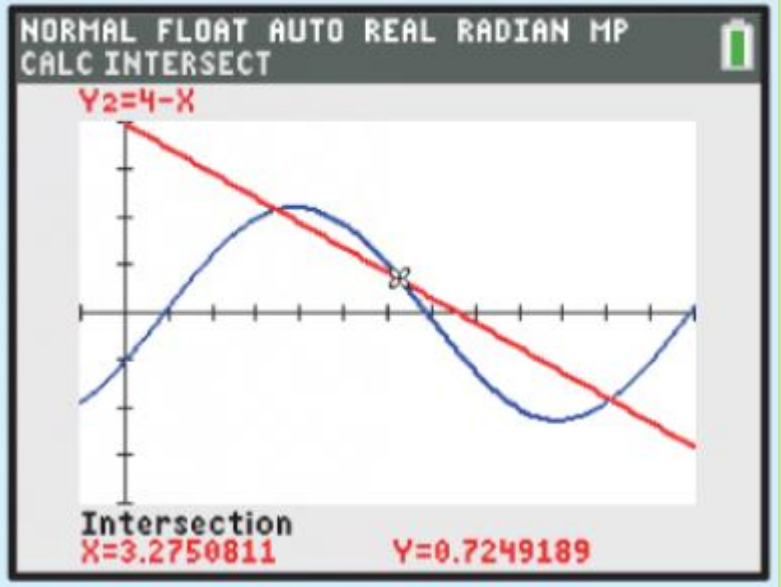
Solve $2\sin x - \cos x = 4 - x$ for $0 \leqslant x \leqslant 2\pi$.

We graph the functions $Y_1 = 2\sin X - \cos X$ and $Y_2 = 4 - X$ on the same set of axes.

!!! We use **window** settings just larger than the domain:

$$X\min = -\frac{\pi}{6} \quad X\max = \frac{13\pi}{6} \quad X\text{scale} = \frac{\pi}{6}$$

TI-84 Plus CE



The solutions are $x \approx 1.82$, 3.28, and 5.81 .

Title:	TRIGONOMETRIC EQUATIONS	Date:

PART 2 - Solving equaitons using algebra

Title:	TRIGONOMETRIC EQUATIONS	Date:

5 Solve for x on $0 \leqslant x \leqslant 2\pi$:

a $\cos^2 x = \frac{3}{4}$ **b** $\sin^2 x = 1$ **c** $\tan^2 x = 3$

Solve exactly for $0 \leqslant x \leqslant 3\pi$:

a $\sin x = -\frac{1}{2}$ **b** $\sin 2x = -\frac{1}{2}$ **c** $\sin\left(x - \frac{\pi}{6}\right) = -\frac{1}{2}$

Title:	TRIGONOMETRIC EQUATIONS	Date:

9 Solve for x on $0 \leqslant x \leqslant 2\pi$:

a $\sin 2x = -\frac{1}{2}$ **b** $\cos 3x = \frac{\sqrt{3}}{2}$ **c** $\tan 2x - \sqrt{3} = 0$

d $\sin \frac{x}{2} = \frac{1}{\sqrt{2}}$ **e** $2\cos \frac{x}{2} + 1 = 0$ **f** $3\tan \frac{x}{3} - 3 = 0$

10 Solve for x on $0 \leqslant x \leqslant 2\pi$:

a $\cos^2 3x = \frac{1}{4}$ **b** $\sin^2 2x = 1$ **c** $\tan^2\left(\frac{x}{2}\right) = \frac{1}{3}$

Title:	TRIGONOMETRIC EQUATIONS	Date:

9 Solve for x on $0 \leqslant x \leqslant 2\pi$:

c $\tan 2x - \sqrt{3} = 0$

f $3\tan\frac{x}{3} - 3 = 0$

Title:	TRIGONOMETRIC EQUATIONS	Date:

c $\tan^2\left(\frac{x}{2}\right) = \frac{1}{3}$ $0 \leqslant x \leqslant 2\pi,$

Title:	TRIGONOMETRIC EQUATIONS	Date:

Find the exact solutions of $\sqrt{3}\sin x = \cos x$ for $0 \leqslant x \leqslant 2\pi$.

11 Find the exact solutions for $0 \leqslant x \leqslant 2\pi$:

a $\sin x = -\cos x$

b $\sin 3x = \cos 3x$

c $\sin 2x = \sqrt{3}\cos 2x$

Title:	TRIGONOMETRIC EQUATIONS	Date:

Solve $\sqrt{2}\cos\left(x - \frac{3\pi}{4}\right) + 1 = 0$ for $0 \leqslant x \leqslant 6\pi$

Title:	TRIGONOMETRIC EQUATIONS	Date:

12 Solve exactly:

a $\cos\left(x - \frac{2\pi}{3}\right) = \frac{1}{2}, \quad -2\pi \leqslant x \leqslant 2\pi$

b $\sqrt{2}\sin\left(x - \frac{\pi}{4}\right) + 1 = 0, \quad 0 \leqslant x \leqslant 3\pi$

c $\sin\left(4\left(x - \frac{\pi}{4}\right)\right) = 0, \quad 0 \leqslant x \leqslant \pi$

d $2\sin\left(2\left(x - \frac{\pi}{3}\right)\right) = -\sqrt{3}, \quad 0 \leqslant x \leqslant 2\pi$

GDC

Transformations

Title:

Date:

Find exact solutions of $\tan(2x - \frac{\pi}{3}) = 1$ for $-\pi \leqslant x \leqslant \pi$.

Title:	TRIGONOMETRIC EQUATIONS	Date:

14 Find the exact solutions of $\tan x = \sqrt{3}$ for $0 \leqslant x \leqslant 2\pi$. Hence solve the following equations for $0 \leqslant x \leqslant 2\pi$:

a $\tan\left(x - \frac{\pi}{6}\right) = \sqrt{3}$ **b** $\tan 4x = \sqrt{3}$ **c** $\tan^2 x = 3$

Title:	TRIGONOMETRIC EQUATIONS	Date:

Solve for x on $0 \leqslant x \leqslant 2\pi$, giving your answers as exact values:

a $2\sin^2 x + \sin x = 0$

b $2\cos^2 x + \cos x - 1 = 0$

Title:	TRIGONOMETRIC EQUATIONS	Date:

15 Solve for $0 \leqslant x \leqslant 2\pi$ giving your answers as exact values:

a $2\sin^2 x - \sin x = 0$

b $2\cos^2 x = \cos x$

c $2\cos^2 x - \cos x - 1 = 0$

d $2\sin^2 x + 3\sin x + 1 = 0$

In **a** we cannot simply divide through by $\sin x$, or we will lose the solutions corresponding to $\sin x = 0$.

Title:	TRIGONOMETRIC EQUATIONS	Date:

6 Find the exact solutions of:

a $\cos x = -\frac{1}{2}, \ 0 \leqslant x \leqslant 5\pi$

b $2\sin x - 1 = 0, \ -360° \leqslant x \leqslant 360°$

c $2\cos x + \sqrt{3} = 0, \ 0 \leqslant x \leqslant 3\pi$

d $\cos(x - \frac{2\pi}{3}) = \frac{1}{2}, \ -2\pi \leqslant x \leqslant 2\pi$

e $2\sin(x + \frac{\pi}{3}) = 1, \ -3\pi \leqslant x \leqslant 3\pi$

f $\sqrt{2}\sin(x - \frac{\pi}{4}) + 1 = 0, \ 0 \leqslant x \leqslant 3\pi$

g $3\cos 2x + 3 = 0, \ 0 \leqslant x \leqslant 3\pi$

h $4\cos 3x + 2 = 0, \ -\pi \leqslant x \leqslant \pi$

i $\sin(4(x - \frac{\pi}{4})) = 0, \ 0 \leqslant x \leqslant \pi$

j $2\sin(2(x - \frac{\pi}{3})) = -\sqrt{3}, \ 0 \leqslant x \leqslant 2\pi$

Title:	TRIGONOMETRIC EQUATIONS	Date:

12 Find the exact solutions to these equations for $0 \leqslant x \leqslant 2\pi$:

a $\sin x = -\cos x$ **b** $\sin(3x) = \cos(3x)$ **c** $\sin(2x) = \sqrt{3}\cos(2x)$

Check your answers using a graphics calculator by finding the points of intersection of the appropriate graphs.

Title:	TRIGONOMETRIC EQUATIONS

24 **P1:** Let $A(t) = 2\cos^2 t - 3\cos t + 1, 0 \leq t \leq 2\pi$.

a Factorize $A(t)$. (2 marks)

b Hence, solve the equation $A(t) = 0$ for $0 \leq t \leq 2\pi$. (4 marks)

Title:	TRIGONOMETRIC EQUATIONS

31 **P1: a** Write the expression $-2\cos^2 x + \sin x + 3$ in the form $a\sin^2 x + b\sin x + c$. (2 marks)

b Hence, solve the equation $-2\cos^2 x + \sin x + 3 = 2$ for $-2\pi \leq x \leq 2\pi$. (5 marks)

ATIONS

Question 1

Solve for $-180^0 \leq x \leq 90^0$

$3\,tan^2\left(\frac{x}{2}\right) - 1 = 0$

Question 2

Find the exact solutions for $0 \leqslant x \leqslant 2\pi$

a) $\sin 2x = \sqrt{3}\cos 2x$

b) $(4\sin^2 x - 3)(\sin x + 2) = 0$

c) $-2\,cos^2(x) - sin(x) + 1 = 0$

Question 3

Solve the equation for $-2\pi \leq x \leq \pi$.

$4\,cos^3(x) + 2\,cos^2(x) - 2\,cos(x) = 0$