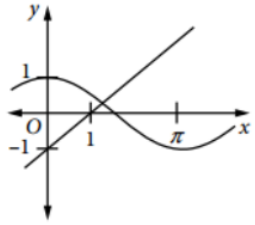
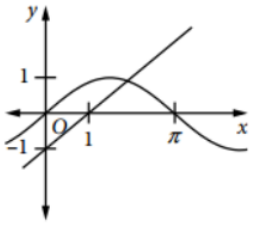
GRAPHICAL SOLUTION OF TRIGONOMETRIC EQUATIONS

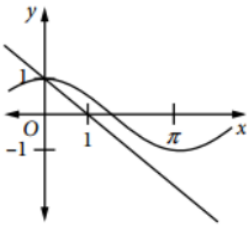
1 Using Desmos, graph the following functions, and use these graphs to find the number of solutions in $0 \leq x \leq \pi$

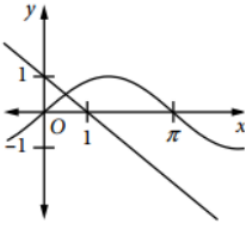
(a) $sin\, x = \frac{x}{2}$ (b) $sin\, x = \frac{x}{2} - 1$ (c) $sin\, x = \frac{x}{2} - x$

4 Which graph could be used to solve the equation $\sin x = x - 1$?

A 

B 

C 

D 

5 By drawing appropriate graphs using Desmos, determine the number of solutions to the equation $sin\, 2x = 1 - \frac{x}{4}$ in the domain $0 \leq x \leq 2\pi$

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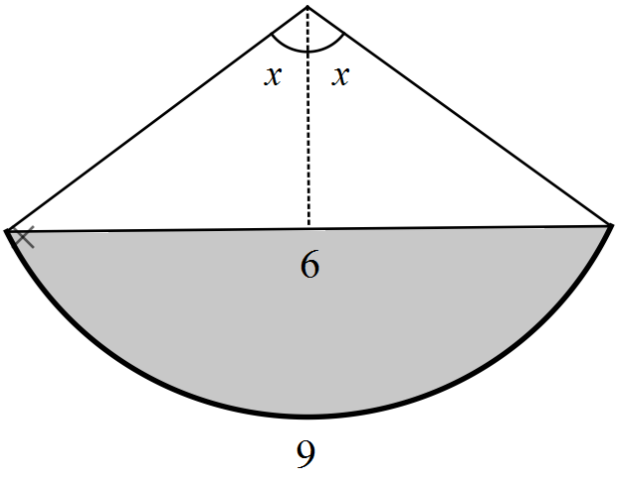
6 A rectangular strip of metal 9 cm wide is bent to form a water channel. The section perpendicular to the length is a circular arc whose chord is 6 cm long.

(a) Show that if the circular arc subtends an angle of $2x$ radians at the centre of the circle, then $3 \sin x = 2x$



(b) Solve the equation in part (a) graphically, giving your answer correct to 1 decimal place.

(c) Find the area of the cross section of the channel in cm^2 (shaded grey on the figure)

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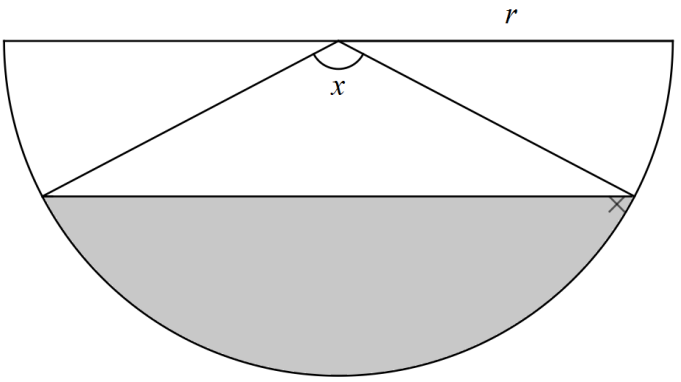
7 A semicircle of radius r is divided into two parts of equal area by a chord parallel to the base (diameter).

(a) If the chord subtends an angle of x radians at the centre, prove that $x - \frac{\pi}{2} = \sin x$

(Note: you will need to use the formula $\sin\frac{x}{2} \times \cos\frac{x}{2} = \frac{\sin x}{2}$)



(b) Solve the equation in part (a) graphically, giving your answer correct to 1 decimal place.

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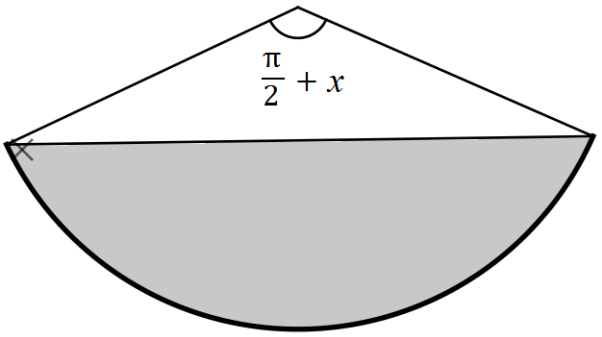
8 The chord of a segment of a circle subtends an angle of $\frac{\pi}{2} + x$ radians at the centre. The area of the segment is one.-quarter the area of the circle.

(a) Prove that $x = \cos x$. Note that you will need to use the formula $\sin\frac{x}{2} \times \cos\frac{x}{2} = \frac{\sin x}{2}$



(b) Solve the equation in part (a) graphically, giving your answer correct to 2 decimal places.