

Trigonometry Overview (30/6/23)

General

Q1

If $\sin\theta = 0.6$, where $0 \leq \theta < 360^\circ$, find $\tan\theta$

Q2

Show that $\frac{d}{d\phi} \sin\phi = \frac{\pi}{180} \cos\phi$, when ϕ is measured in degrees.

Equations

Q3

By means of the substitution $t = \tan\left(\frac{x}{2}\right)$, solve the equation $\sec x + \tan x = 1$, where $0^\circ \leq x \leq 360^\circ$.

Q4

Solve the equation $\sin x - \cos x = 0.5$, for $0^\circ < x < 360^\circ$

Q5

Solve:

(i) $\sin\theta = 0.5$ (no restriction on θ)

(ii) $\cos\theta = 0.5$ (no restriction on θ)

where θ is in radians

Q6

Solve $\sin\left(2\theta - \frac{\pi}{6}\right) = 0.5$ ($0 < \theta < 2\pi$)

Identities**Q7**

Given that $\cos^5\theta = \frac{1}{16}(\cos 5\theta + 5\cos 3\theta + 10\cos\theta)$ and

$\cos^6\theta = \frac{1}{32}(\cos 6\theta + 6\cos 4\theta + 15\cos 2\theta + 10)$,

find expressions for $\sin^5\theta$ and $\sin^6\theta$

Q8

Show that each of (i)-(vi) is true, by two methods:

- (a) using the results (A)-(E) below
 (b) from graphs

- (i) $\sin(\theta + 180) = -\sin\theta$
 (ii) $\cos(180 - \theta) = \cos(180 + \theta)$
 (iii) $\cos(90 - \theta) = -\cos(90 + \theta)$
 (iv) $\sin(\theta - 180) = \cos(\theta + 90)$
 (v) $\sin(\theta + 90) = \cos\theta$
 (vi) $\sin(360 - \theta)$

- (A) $\sin(-\theta) = -\sin\theta$
 (B) $\sin(360 + \theta) = \sin\theta$
 (C) $\sin(180 - \theta) = \sin\theta$
 (D) $\sin\theta = \cos(90 - \theta)$
 (E) $\cos(-\theta) = \cos\theta$

Sketches

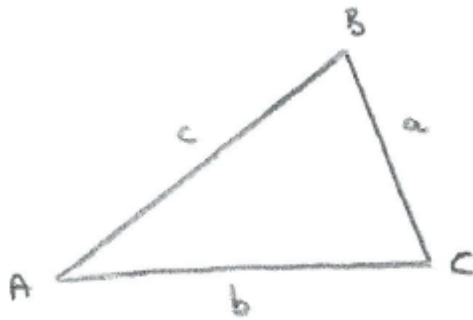
Q9

Sketch $y = \sin(2x + 30^\circ)$

Triangles

Q10

Denote the sides of a triangle by a , b & c , and the angles (opposite these sides respectively) by A , B & C , as in the diagram below.



(i) What combinations of sides and angles will always enable the other sides and angles to be determined uniquely (ie any two triangles thus created will be congruent, so that a reflection in the plane of the paper is allowed)? What combination gives rise to two possibilities in some cases?

(ii) When finding missing lengths and angles, what ambiguous situation can arise (apart from the 2 solutions in IV), and how can it be avoided?

Q11

For the triangle below, what is the best strategy for finding angle A ?

