

TRIGONOMETRY (Q 4 & 5, PAPER 2)

2011

4. (a) Evaluate $\lim_{x \rightarrow \infty} \left(\frac{\sin 2x + \sin x}{3x} \right)$.

(b) Find all the solutions of the equation

$$\sin 2x + \cos x = 0, \text{ where } 0^\circ \leq x \leq 360^\circ.$$

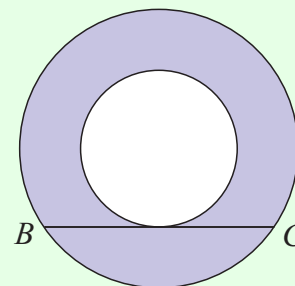
(c) The diagram shows two concentric circles.

A tangent to the inner circle cuts the outer circle at B and C , where $|BC| = 2x$.

(i) Express the area of the shaded region in terms of x .

(ii) In the case where the radius of the outer circle is $2x$, show that the portion of the shaded region that lies below BC has area

$$\left(\frac{2\pi}{3} - \sqrt{3} \right) x^2.$$



5. (a) Find the values of x for which $3 \tan x = \sqrt{3}$, where $0^\circ \leq x \leq 360^\circ$.

(b) (i) Prove that $\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$.

(ii) Show that if $\alpha + \beta = 90^\circ$, then $\frac{\tan 2\alpha}{\tan 2\beta} = -1$.

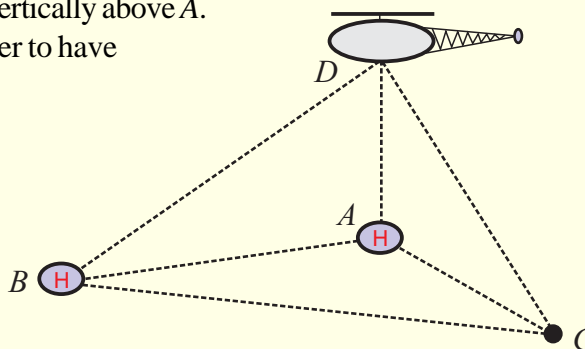
(c) A and B are two helicopter landing pads on level ground. C is another point on the same level ground. $|BC| = 800$ metres, $|AC| = 900$ metres, and $|\angle BCA| = 60^\circ$.

A helicopter at point D is hovering vertically above A .

A person at C observes the helicopter to have an angle of elevation of 30° .

(i) Find $|AD|$, in surd form.

(ii) Find $|BD|$.



ANSWERS

- 4 (a) 1
(b) $90^\circ, 210^\circ, 270^\circ, 330^\circ$
(c) (i) πx^2

- 5 (a) $30^\circ, 210^\circ$
(c) (i) $300\sqrt{3}$ m (ii) 1,000 m