

QUESTION 3

3.1 Given : $\sin \beta = \frac{1}{3}$ where $\beta \in (90^\circ; 270^\circ)$, determine the following by using a sketch and without the use of a calculator:

$$3.1.1 \quad \tan \beta \quad (3)$$

$$3.1.2 \quad \cos 2\beta \quad (2)$$

$$3.1.3 \quad \cos(-\beta - 450^\circ) \quad (2)$$

3.2 Simplify the following to a single trigonometric ratio:

$$\frac{4 \cos(-x) \cdot \cos(90^\circ + x)}{\sin(30^\circ - x) \cdot \cos x + \cos(30^\circ - x) \cdot \sin x} \quad (6)$$

3.3 If $\cos 23^\circ = a$, express the following in terms of a :

$$3.3.1 \quad \tan 203^\circ \quad (3)$$

$$3.3.2 \quad \sin 46^\circ \quad (3)$$

3.4 Determine the values of the following, without using a calculator:

$$3.4.1 \quad \sin 105^\circ \quad (4)$$

$$3.4.2 \quad \cos 69^\circ \cdot \cos 9^\circ + \cos 81^\circ \cdot \cos 21^\circ \quad (3)$$

3.5 Prove the following identity: $\frac{\sin 2x - \cos x}{1 - \cos 2x - \sin x} = \frac{1}{\tan x}$ (5)

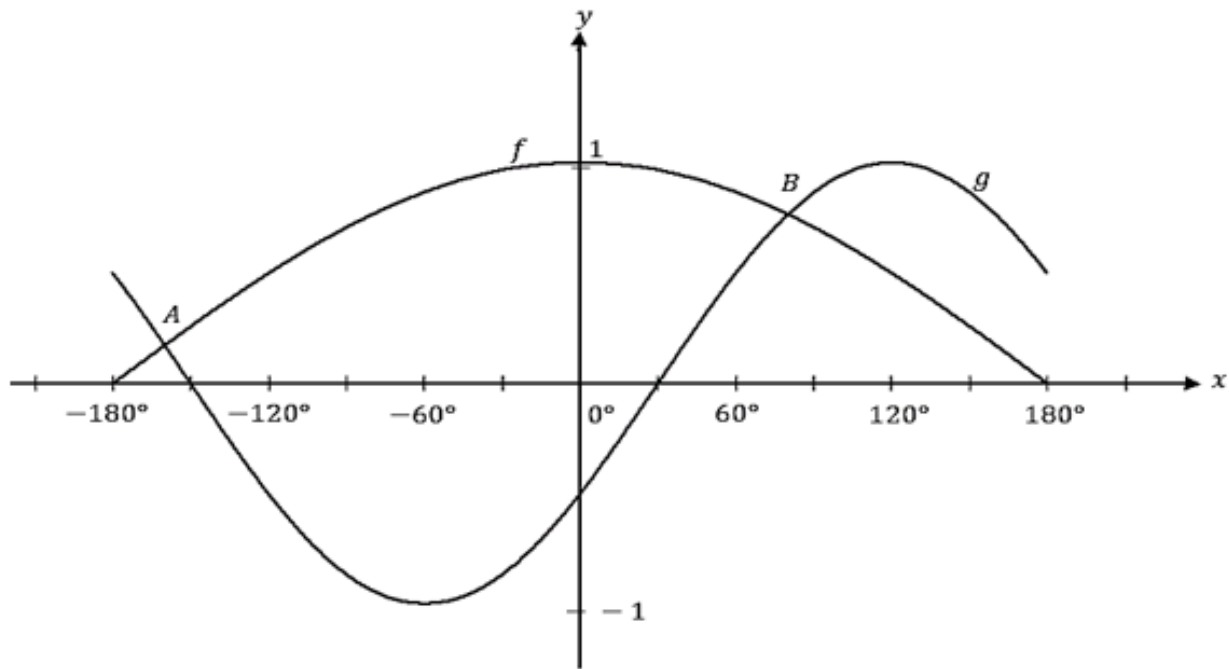
3.6 Calculate the value of x , if $x \in [-180^\circ; 360^\circ]$

$$\cos 2x = \cos x + 2 \quad (7)$$

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QUESTION 4

The graphs of $f(x) = \cos \frac{x}{2}$ and $g(x) = \sin(x - 30^\circ)$ for $x \in [-180^\circ; 180^\circ]$ are drawn below. The graphs intersect at points A and B.

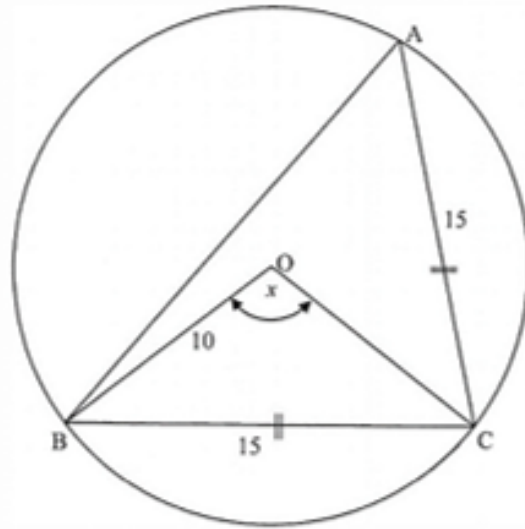


- 4.1 Write down the value of $f(0^\circ) - g(0^\circ)$ (1)
- 4.2 Give the period of $f(4x)$ (2)
- 4.3 Write down the range of $4g(x)$ (2)
- 4.4 Given that the general solution of $f(x) = g(x)$ is: $x = 80^\circ - k \cdot 240^\circ, k \in \mathbb{Z}$.
Determine the x values of A and B. (2)
- 4.5 For which value(s) of x will.
- 4.5.1 $f(x) > g(x)$ (2)
- 4.5.2 $f'(x) \cdot g(x) > 0$ where $x > 0^\circ$ (2)

[11]

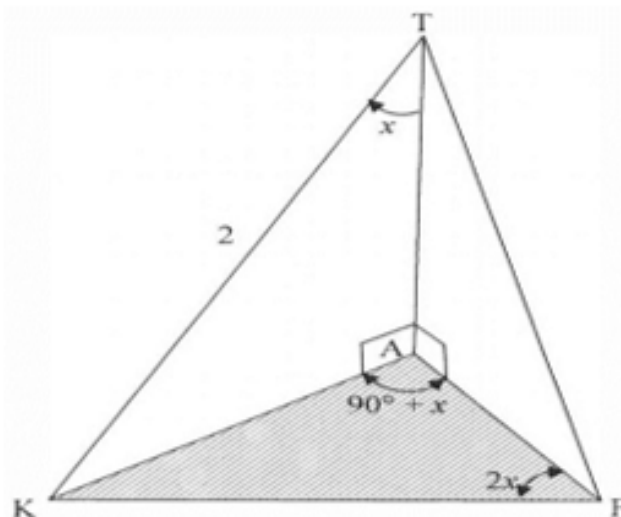
QUESTION 5

- 5.1 In the diagram below, a circle with centre O passes through A , B and C .
 $BC = AC = 15$ units. BO and OC are joined. $OB = 10$ units and $\widehat{BOC} = x$



- 5.1.1 Calculate the size of x . (3)
- 5.1.2 Calculate the area of triangle ABC . (4)

- 5.2 In the figure, points K , A and F lie in the same horizontal plane and TA represents a vertical tower. $\widehat{ATK} = x$, $\widehat{KAF} = 90^\circ + x$ and $\widehat{KFA} = 2x$ where $0^\circ < x < 30^\circ$ and $TK = 2$ units.

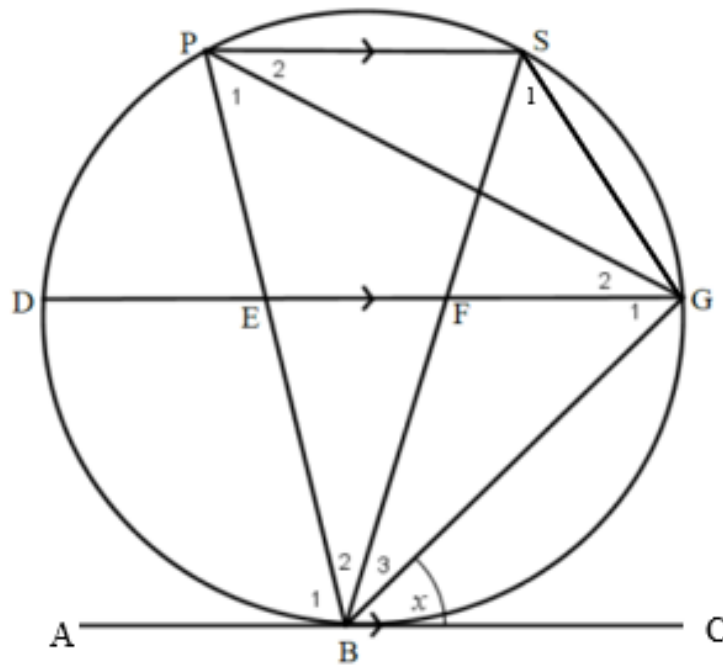


- 5.2.1 Express AK in terms of $\sin x$. (2)
- 5.2.2 Determine the value of KF (5)

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QUESTION 7.3

- 7.3 In the diagram, P, S, G, B and D are points on the circumference of the circle such that $PS \parallel DG \parallel AC$. ABC is a tangent to the circle at B. $\widehat{GBC} = x$.



Prove that:

7.3.1 $\triangle PGB \sim \triangle GEB$ (4)

7.3.2 $SB \cdot FB = EB \cdot PB$ (3)

7.3.3 If $GB = GE = 9\text{cm}$ and $EB = \frac{3}{5} PG$, determine the length of PG. (3)

[20]