UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

# Grade 12 Mathematics P2

## TRIGONOMETRY

### Questions 6 and 7

### November 2018

### Solutions in a step-by-step method

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# QUESTION 6
# 13 Marks

**6.1** $$\frac{180^{o}}{\frac{3}{2}}=\frac{180^{o}}{1}\div\frac{3}{2}=\frac{180^{o}}{1}\times\frac{2}{3}=120^{o}$$

**The period of $f$ is $120^{0}$**

**6.2** [redacted]

$$y = -2\tan\frac{3}{2}x$$

$x$ $y$

*Point* $A(t;2)$ *lies on the graph*

$$2 = -2\tan\frac{3}{2}t$$

$$-2\tan\frac{3}{2}t = 2$$

$$\frac{-2}{-2}\tan\frac{3}{2}t = \frac{2}{-2}$$

$$\tan\frac{3}{2}t = -1$$

$$\frac{3}{2}t \text{¿} \tan^{-1} -1$$

$45^0$ [redacted]

**Method 1**

*tan*

$2^{nd}$ *quadrant* $\mathbf{180^0 - \theta}$

$$\frac{3}{2}t = (180^0 - 45^0) + k.180^0$$

$$\frac{3}{2}t = 135^0 + k.180^0$$

$$\frac{2}{3}\times\frac{3}{2}t = 135^0 \times \frac{2}{3} + k.180^0 \times \frac{2}{3}$$

$4^{th}$ *quadrant* $\mathbf{-\theta}$

$$\frac{3}{2}t = -45^0 + k.180^0$$

$$\frac{2}{3}\times\frac{3}{2}t = -45^0 \times \frac{2}{3} + k.180^0 \times \frac{2}{3}$$

$$\boldsymbol{t = -30^0 + k.120^0; k \epsilon Z}$$

**6.2** [redacted]

$$y = -2\tan\frac{3}{2}x$$

$x$ $y$

*Point* $A(t;2)$ *lies on the graph*

$$2 = -2\tan\frac{3}{2}t$$

$$-2\tan\frac{3}{2}t = 2$$

$$\frac{-2}{-2}\tan\frac{3}{2}t = \frac{2}{-2}$$

$$\tan\frac{3}{2}t = -1$$

$$\frac{3}{2}t \text{ ¿ } \tan^{-1} -1$$

$45^0$

[redacted]

**Method 2**

*tan*

$2^{nd}$ *quadrant* $\mathbf{180^0 - \theta}$

$$\frac{3}{2}t = (180^0 - 45^0) + k.360^0$$

$$\frac{3}{2}t = 135^0 + k.360^0$$

$$\frac{2}{3}\times\frac{3}{2}t = 135^0 \times \frac{2}{3} + k.360^0 \times \frac{2}{3}$$

$4^{th}$ *quadrant* $\mathbf{360^0 - \theta}$

$$\frac{3}{2}t = (360^0 - 45^0) + k.360^0$$

$$\frac{2}{3}\times\frac{3}{2}t = 315^0 \times \frac{2}{3} + k.360^0 \times \frac{2}{3}$$

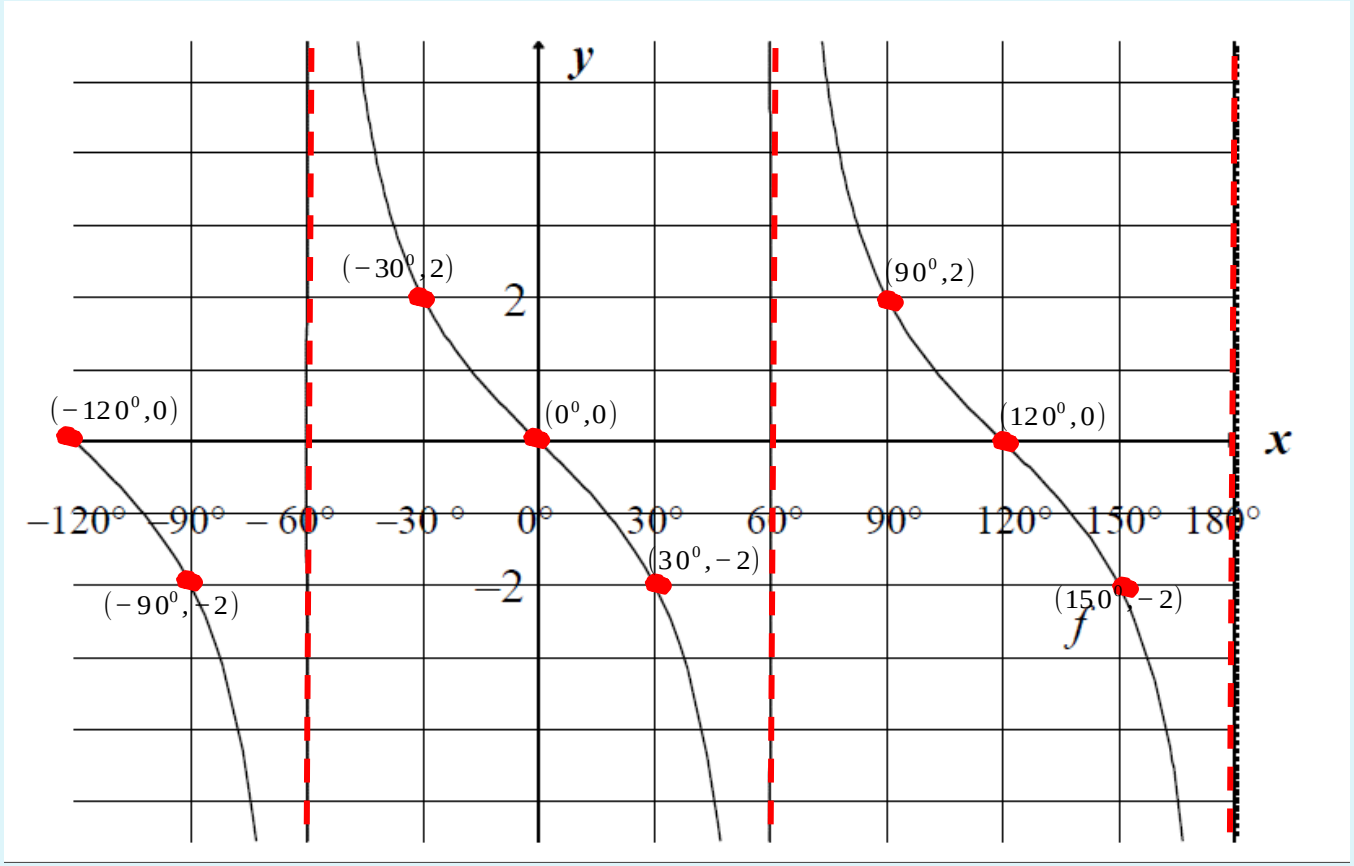
$$\boldsymbol{t = 210^0 + k.240^0; k \epsilon Z}$$

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |

To save time
"use your calculator"

Step 1: Mode
Step 2: Option 3 (Table)
Input:
Start:
End: 180
Steps: 30

to input x: press 'alpha'



6.4

**Method 1**

$x \in$  or 

**Method 2**

$-60^{0} < x \geq -30^{0}$ or $-60^{0} < x \geq 90^{0}$

6.5 $\frac{3}{2}x+60^0=0$

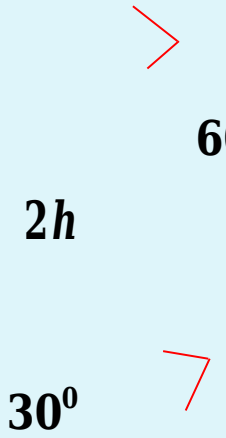
$$\frac{3}{2}x=-60^0$$

$$\frac{2}{3}\times\frac{3}{2}x=-60^0\times\frac{2}{3}$$

$$\boldsymbol{x=-40^0}\quad \textbf{\textit{Translation of }}\boldsymbol{40^0}\textbf{\textit{ to the left}}$$

$$\therefore g(x)=-2\tan\left(\frac{3}{2}x+40^0\right)=\boldsymbol{f(x+40^0}¿)¿$$

# QUESTION 7
# 6 Marks




**7.1**

***Method 1***

$A\hat{B}D = 30^0$ *Alternate angles (Parallel lines)*

$$\sin 30^0 = \frac{Opp}{hyp}$$

$$\sin 30^0 = \frac{h}{AB}$$

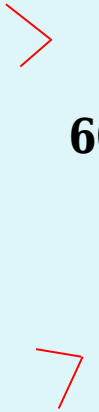
$$AB = \frac{h}{sin\,30^0}$$

$$AB = \frac{h}{\frac{1}{2}}$$

$$AB = \frac{h}{1} \div \frac{1}{2}$$

$$AB = \frac{h}{1} \times \frac{2}{1}$$

$$\boldsymbol{AB = 2h}$$




**7.1**

***Method 2***

B

$$\cos 60^0 = \frac{Adj}{hyp}$$

$$\cos 60^0 = \frac{h}{AB}$$

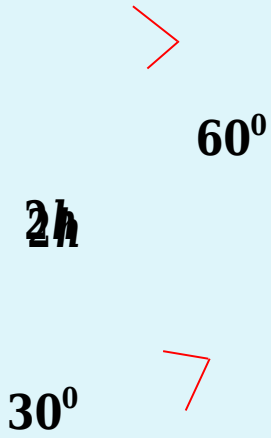
$$AB = \frac{h}{cos\,60^0}$$

$$AB = \frac{h}{\frac{1}{2}}$$

$$AB = \frac{h}{1} \div \frac{1}{2}$$

$$AB = \frac{h}{1} \times \frac{2}{1}$$

$$\boldsymbol{AB = 2h}$$




**7.2**

$$BC^2 = AB^2 + AC^2 - 2 \cdot AB \cdot AC \cdot Cos\, B\hat{A}C$$

$$BC^2 = (2h)^2 + (3h)^2 - 2 \cdot 2h \cdot 3h \cdot Cos\, 2x$$

$$BC^2 = 4h^2 + 9h^2 - 12h^2(2Cos^2 - 1)$$

$$BC^2 = 4h^2 + 9h^2 - 24h^2 Cos^2 x + 12h^2$$

$$BC^2 = 25h^2 - 24h^2 Cos^2 x$$

$\Delta ABC$ Cosine rule

ignore

$Cos\, 2x$

$\cos^2 x - \sin^2 x$

$1 - 2\sin^2 x$

use

1

**answer expressed in terms of $\cos^2 x$**

$$BC = \sqrt{h^2(25 - 24Cos^2 x)}$$

$$\therefore \mathbf{BC = h\sqrt{25 - 24\,Cos^2 x}}$$

# The End