MATHEMATICS

GRADE 11 FUNCTIONS AND GRAPHS

CAPS ALIGNED

TRIGONOMETRIC FUNCTIONS

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Functions– Grade 11

1. Functions (Including Trigonometric functions)

1. Revise the effect of the parameters a and q and investigate the effect of p on the graphs of the functions defined by:
   1.1. $y = f(x) = a(x+p)^2 + q$
   1.2. $y = f(x) = \frac{a}{x+p} + q$
   1.3. $y = f(x) = a.b^{x+p} + q$ where $b > 0, b \neq 1$
2. Investigate numerically the average gradient between two points on a curve and develop an intuitive understanding of the concept of the gradient of a curve at a point
3. Point by point plotting of basic graphs defined by $y = \sin\theta$, $y = \cos\theta$ and $y = \tan\theta$ for $\theta \in [-360^\circ, 360^\circ]$
4. Investigate the effect of the parameter k on the graphs of the functions defined by,
   $y = \sin(kx)$, $y = \cos(kx)$ and $y = \tan(kx)$
5. Investigate the effect of the parameter p on the graphs of the functions defined by,
   $y = \sin(x+p)$, $y = \cos(x+p)$ and $y = \tan(x+p)$
6. Draw sketch graphs defined by:
   $y = a \sin k(x+p)$,
   $y = a \cos k(x+p)$ and
   $y = a \tan k(x+p)$
   at most two parameters at a time

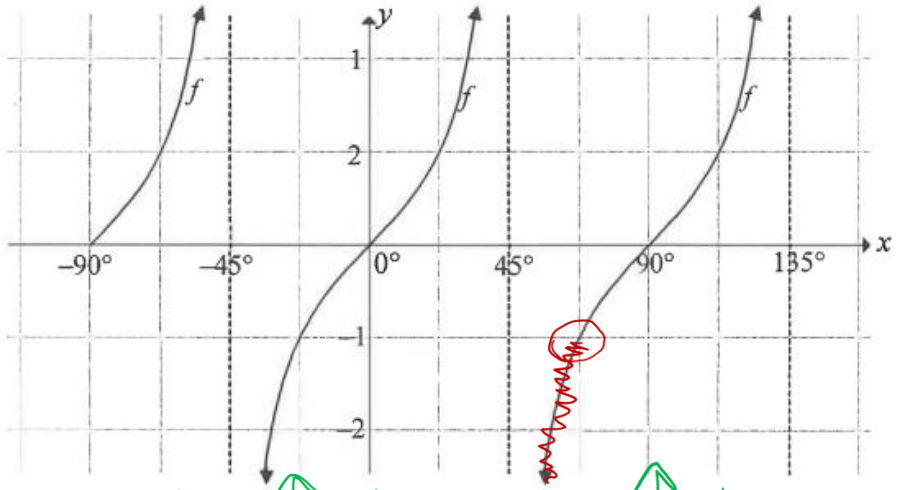
2. Examination Guideline

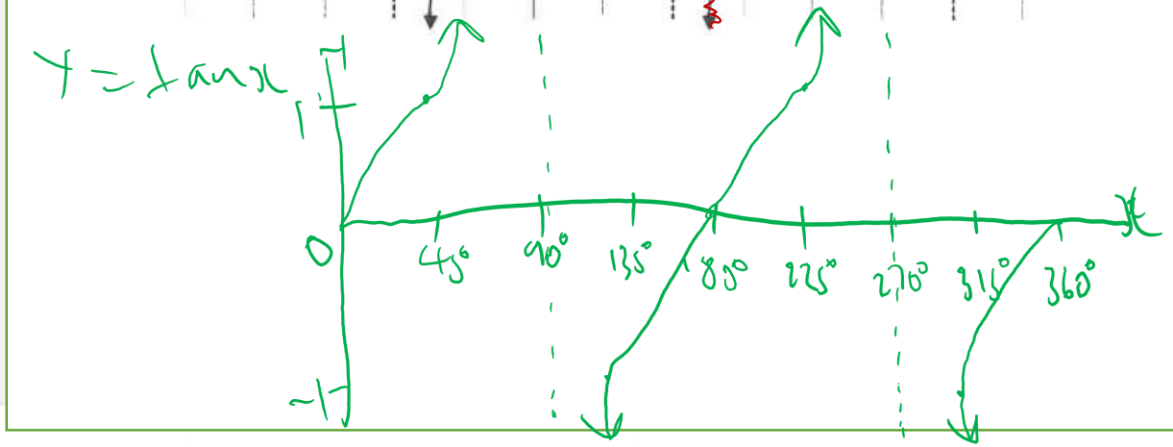
1. Candidates must be able to use and interpret functional notation. In the teaching process learners must be able to understand how $f(x)$ has been transformed to generate $f(-x)$, $-f(x)$, $f(x+a)$, $f(x)+a$ and $af(x)$ where $a \in R$.
2. Trigonometric functions will ONLY be examined in Paper 2.
3. Not more than two transformations will be applied to a function simultaneously.

Exercise A

QUESTION 6

6.1 In the diagram, the graph of $f(x) = \tan bx$ is drawn for the interval $-90° \le x \le 135°$.





6.1.1 Determine the value of b.

$\frac{90°}{b} = 45°$

$b = 2$

6.1.2 Determine the values of x in the interval $0° \le x \le 135°$ for which $f(x) \le -1$.

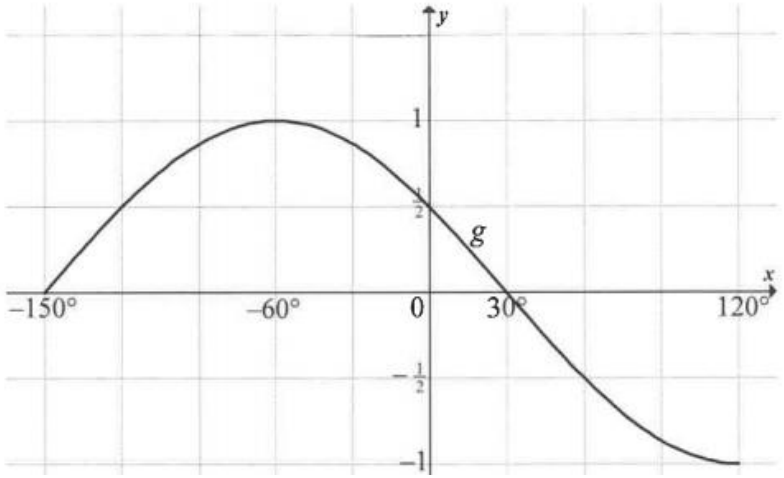
$45° < x \le 67,5°$

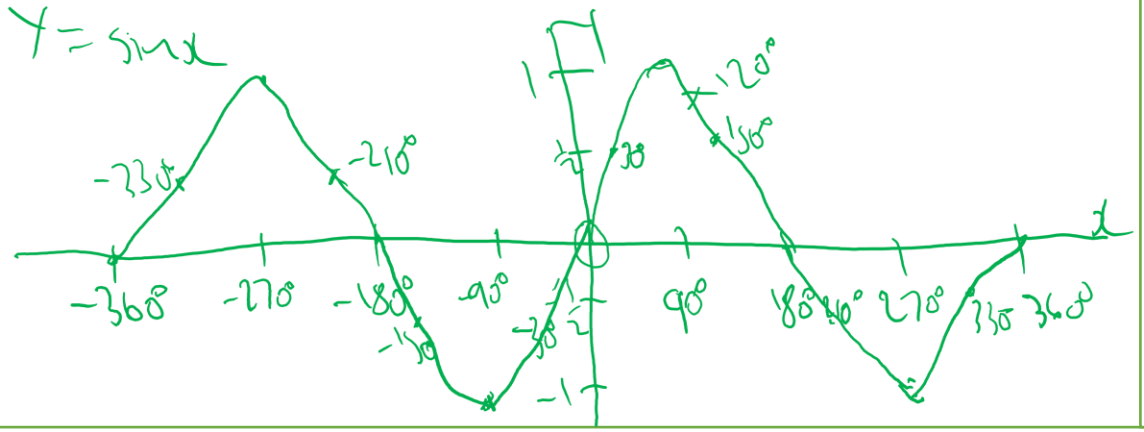
6.1.3 Graph h is defined as $h(x) = \tan b(x + 55°)$. Write down the equations of the asymptotes of h in the interval $-90° \le x \le 135°$.

$\therefore x = -10°$ and $x = 80°$

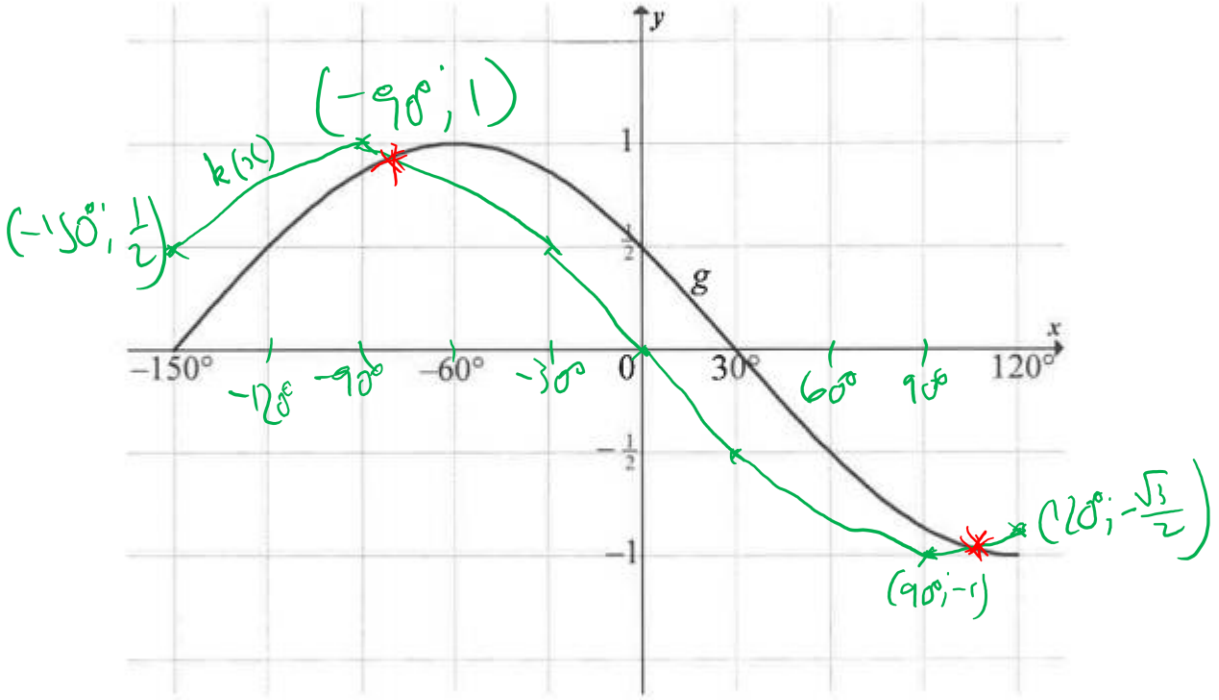
Exercise B

6.2 In the diagram, the graph of $g(x) = \cos(x + 60°)$ is drawn for the interval $-150° \le x \le 120°$.



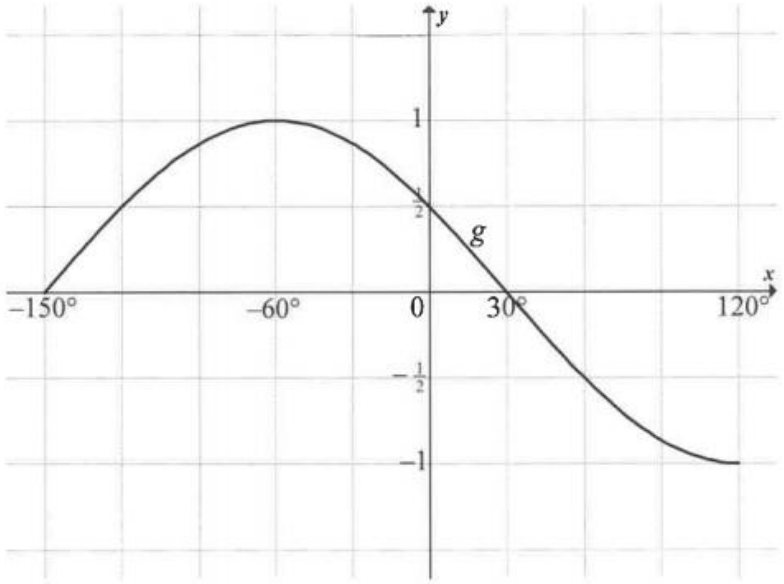


6.2.1 On the same system of axes, draw the graph of $k(x) = -\sin x$ for the interval $-150° \le x \le 120°$. Show ALL the intercepts with the axes as well as the coordinates of the turning points and end points of the graph.



Exercise B cont.

6.2 In the diagram, the graph of $g(x) = \cos(x + 60°)$ is drawn for the interval $-150° \leq x \leq 120°$.



e.g $\cos x = a$

$x = \pm \cos^{-1}(a) + k \cdot 360°$

$\therefore x = \cos^{-1}(a) + k \cdot 360°$ or $x = -\cos^{-1}(a) + k \cdot 360°$

6.2.2 Determine the minimum value of $h(x) = \cos(x + 60°) - 3$.

minimum value $= -4$

6.2.3 Solve the equation $\cos(x + 60°) + \sin x = 0$ for the interval $-150° \leq x \leq 120°$.

$\cos(x + 60°) + \sin x = 0$

$\cos(x + 60°) = -\sin x$

$\cos(x + 60°) = \cos(90° + x)$

$x + 60° = \pm(90° + x) + k \cdot 360°$

$x + 60° = 90° + x + k \cdot 360°$ or $x + 60° = -90° - x + k \cdot 360°$

$60° = 90° + k \cdot 360°$ or $2x = -150° + k \cdot 360°$

No solution $x = -75° + k \cdot 180°;\ k \in Z$

$\therefore x = -75°$ or $x = 105°$

6.2.4 Determine the values of x for the interval $-150° \leq x \leq 120°$, for which $\cos(x + 60°) + \sin x > 0$.

$\cos(x + 60°) > -\sin x$

$\therefore -75° < x < 105°$

END

$$e^{i\pi}+1=0$$

Euler's Identity

SOURCES

1. *FET CAPS DOCUMENT*
2. *GRADE 11 EXAMINATION GUIDELINES*
3. *GRADE 11DBE/NOVEMBER 2015 -2018*