



# KWAZULU-NATAL PROVINCE

EDUCATION  
REPUBLIC OF SOUTH AFRICA



## NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS

COMMON TEST

JUNE 2022

[Stanmorephysics.com](http://Stanmorephysics.com)

MARKS: 100

TIME: 2 hours

This question paper consists of 6 pages and  
2 DIAGRAM SHEETS.

## INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 6 questions.
2. Answer ALL the questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. TWO DIAGRAM SHEETS for QUESTION 3.2, QUESTION 4, and QUESTION 5 are attached at the end of this question paper.  
Detach the DIAGRAM SHEETS and hand in together with your ANSWER BOOK.
10. Write neatly and legibly.

**QUESTION 1**

1.1 Consider the following linear number pattern: 11 ; 17 ; 23 ; 29 ; ..... ; 299 .

1.1.1 Determine  $T_n$ , the general term of this pattern, in the form  $T_n = an + b$ . (2)

1.1.2 Calculate the value of the 20<sup>th</sup> term in this pattern. (2)

1.1.3 Calculate the number of terms in this pattern. (2)

1.1.4 The terms of this linear number pattern is the sequence of 1<sup>st</sup> differences of a quadratic number pattern, i.e. the 1<sup>st</sup> differences of the quadratic number pattern are 11 ; 17 ; 23 ; ...  
If the fifth term of this quadratic number pattern is 100, what will be the value of the second term? (2)

1.2 Consider the following quadratic number pattern: -16 ; -12 ; -4 ; 8 ; .....

1.2.1 Write down the next two terms in the pattern. (2)

1.2.2 Determine  $T_n$ , the general term of this pattern, in the form  $T_n = an^2 + bn + c$ . (4)

1.2.3 Show that all the terms of this number pattern are even numbers. (2)

1.2.4 A new pattern with general term  $P_n$  is formed such that  $P_n = T_n - 128$ . How many negative terms will there be in this new pattern? (4)

**[20]**

**QUESTION 2**

Given:  $f(x) = -x^2 + 3x + 10$

2.1 Calculate the coordinates of the turning point of  $f$ . (3)

2.2 Write down the range of  $f$ . (1)

2.3 Calculate the  $x$ -intercepts of  $f$ . (3)

2.4 Sketch the graph of  $f$ , clearly indicating all the intercepts with the axes and the coordinates of the turning point. (4)

2.5 For which values of  $k$  will  $-x^2 + 3x + 10 = k$  have two positive, unequal real roots? (2)

2.6 The graph of  $f$  is translated 2 units to the right and 3 units down to obtain the graph of  $g$ . Write down the equation of  $g$  in the form  $g(x) = a(x + p)^2 + q$ . (3)

**[16]**

## QUESTION 3

3.1 Given:  $h(x) = \left(\frac{1}{3}\right)^x + 4$

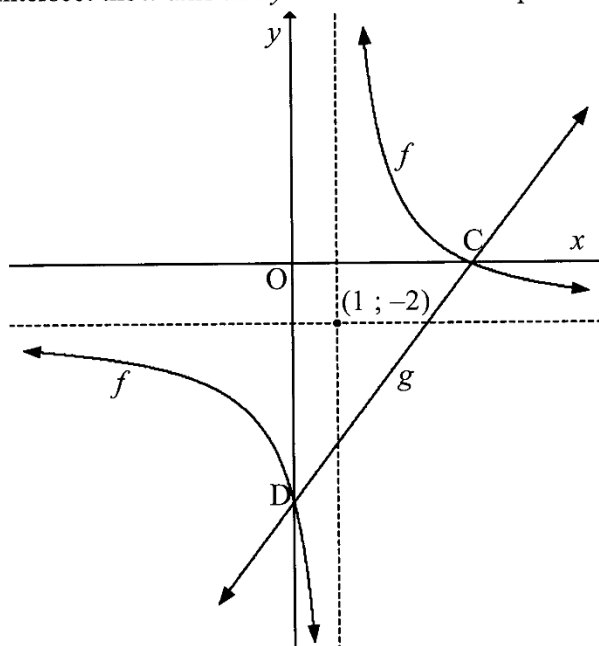
3.1.1 Write down the equation of the asymptote of  $h$ . (1)

3.1.2 Draw a sketch graph of  $h$ , clearly indicating the asymptote and any intercepts with the axes. (3)

3.1.3 Two transformations are applied to  $h$  to obtain the graph of  $m(x) = -3^x - 4$ . Write down the two transformations. (2)

3.2 The diagram below shows the graphs of  $f(x) = \frac{a}{x+p} + q$  and  $g(x) = mx - 8$ .

- The asymptotes of  $f$  intersect at  $(1; -2)$ .
- Graphs  $f$  and  $g$  intersect the  $x$ -axis and  $y$ -axis at C and D respectively.



3.2.1 Write down the values of  $p$  and  $q$ . (2)

3.2.2 Write down the domain of  $f$ . (1)

3.2.3 Calculate the value of  $a$ . (3)

3.2.4 Calculate the value of  $m$ . (4)

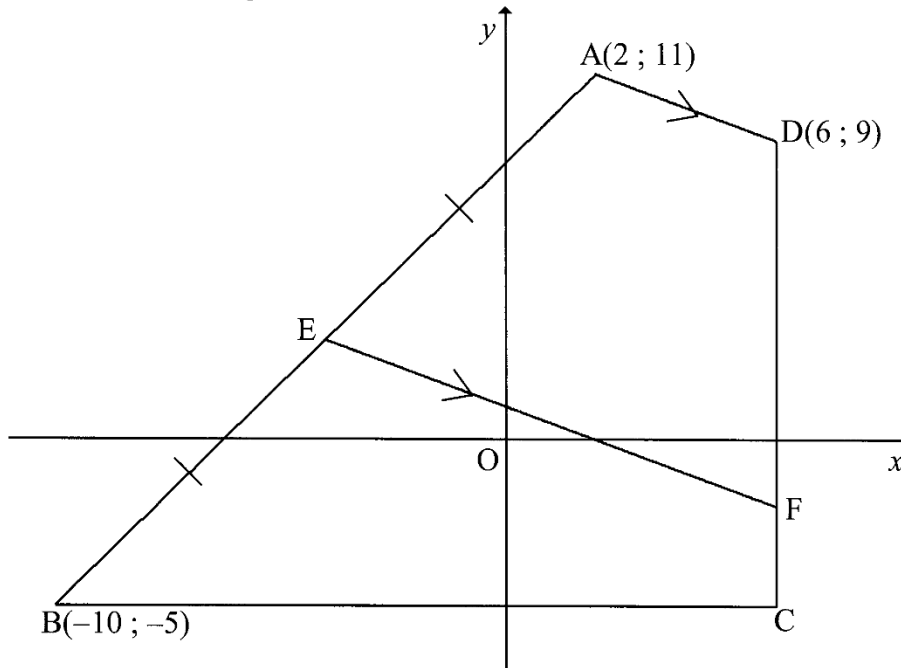
3.2.5 Determine the equation of the axis of symmetry of  $g$  that has a positive gradient. (2)

3.2.6 For which values of  $x$  will  $f(x) \leq g(x)$ ? (3)

[21]

**QUESTION 4**

In the diagram below,  $A(2 ; 11)$ ,  $B(-10 ; -5)$ ,  $C$  and  $D(6 ; 9)$  are the vertices of a quadrilateral in the Cartesian plane.  $BC$  is a horizontal line and  $CD$  a vertical line.  $E$  is the midpoint of  $AB$ .  $F$  is a point on  $CD$  such that  $EF$  is parallel to  $AD$ .

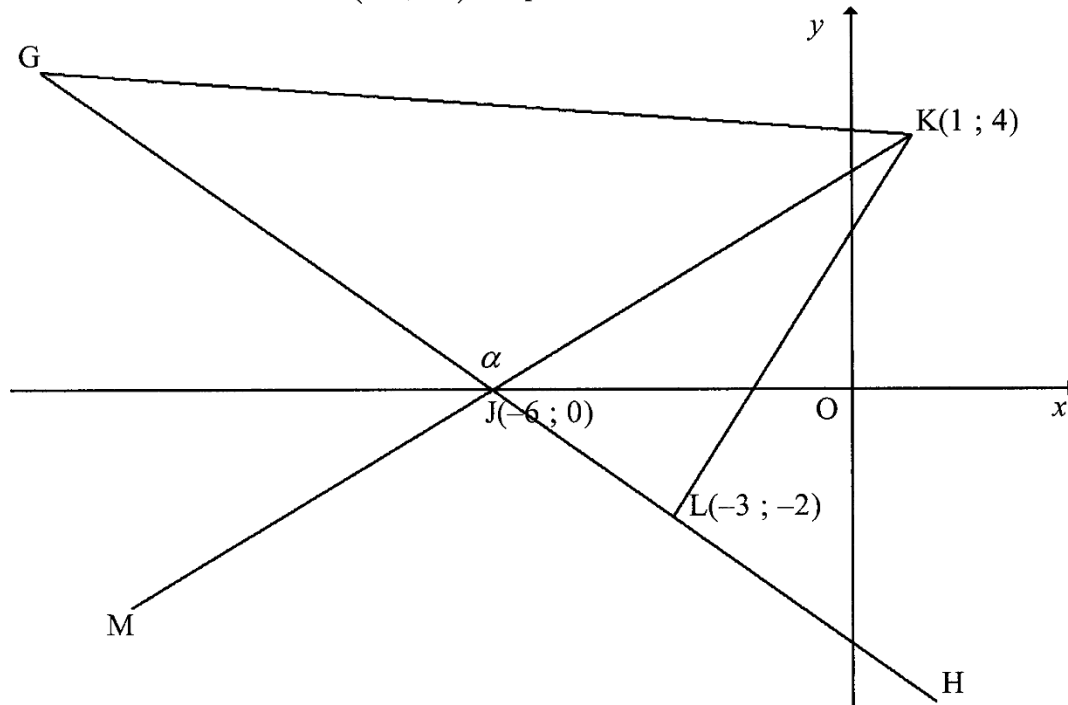


- 4.1 Write down the coordinates of  $C$ . (2)
- 4.2 Calculate the coordinates of  $E$ . (2)
- 4.3 Determine the equation of  $EF$ . (4)
- 4.4 Calculate the coordinates of  $F$ . (2)

**[10]**

### QUESTION 5

In the diagram below, straight line GH cuts the  $x$ -axis at  $J(-6; 0)$ . K is the point  $(1; 4)$ . KJ is produced to M and GK is drawn.  $L(-3; -2)$  is a point on GH and KL is drawn.  $\hat{GJK} = \alpha$ .



- 5.1 Calculate the gradient of GH. (2)
- 5.2 Calculate the angle of inclination of MK. (4)
- 5.3 Determine the size of angle  $\alpha$ . (3)
- 5.4 Prove that  $KL \perp JL$ . (3)
- 5.5 Calculate the area of  $\Delta KJL$ . (5)

[17]

### QUESTION 6

- 6.1 Prove that  $(1 - \sin^2 \theta)(1 + \tan^2 \theta) = 1$ . (3)
- 6.2 Solve for  $x$  if  $\sin(2x + 30^\circ) = -0,4$  and  $x \in [-90^\circ; 90^\circ]$  (7)
- 6.3 Determine the general solution of  $3 \sin x \cos x - 4 \cos^2 x = 0$ . (6)

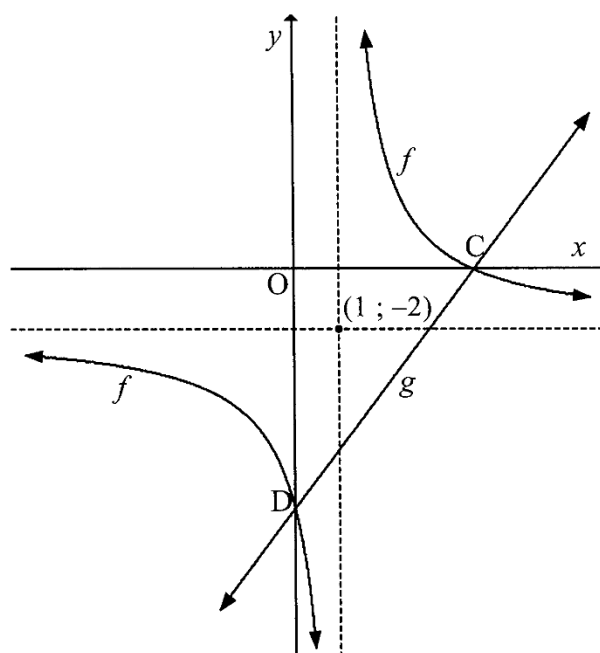
[16]

**TOTAL: 100**

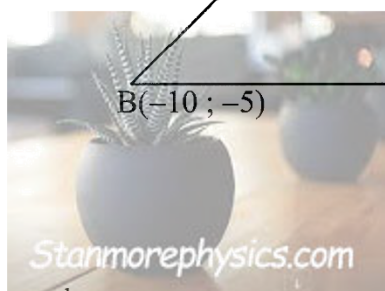
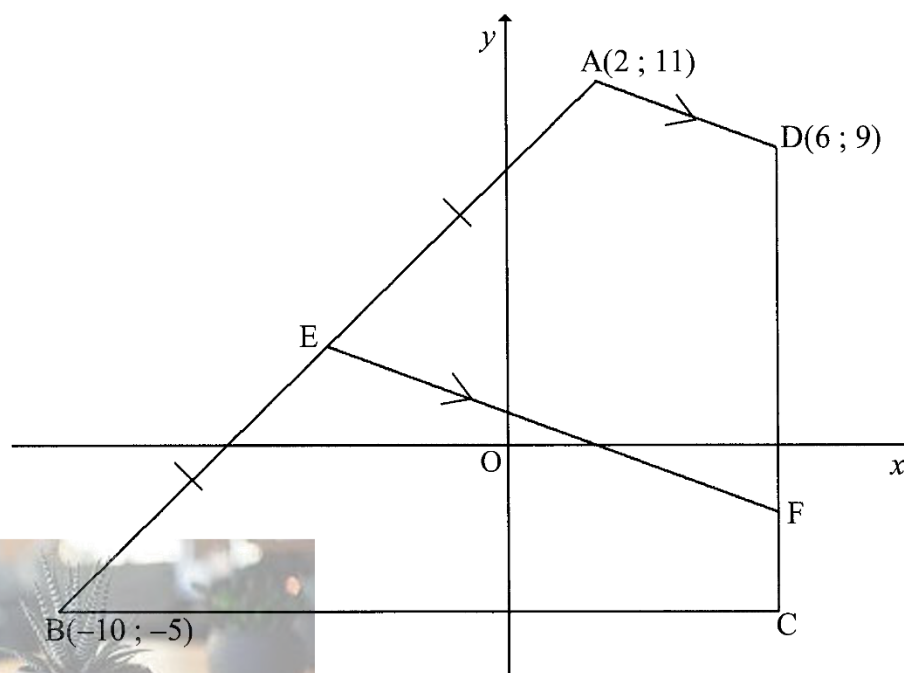
NAME &amp; SURNAME:

## DIAGRAM SHEET 1

## QUESTION 3.2



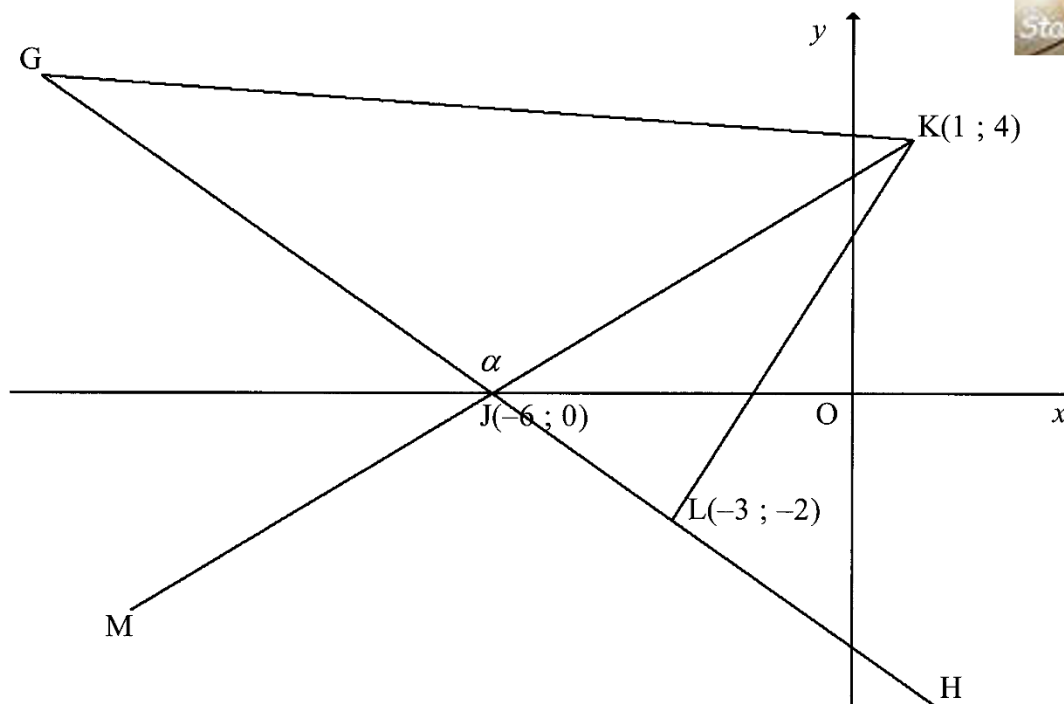
## QUESTION 4



NAME & SURNAME:

DIAGRAM SHEET 2

QUESTION 5



TEAR OFF