GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG DEPARTMENT OF EDUCATION

PROVINCIAL EXAMINATION

JUNE 2019

GRADE 11

MATHEMATICS
PAPER 1

TIME: 2 hours

MARKS: 100

7 pages and 1 answer sheet

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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 the question paper.
4. Use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
5. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
6. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.
7. Answers only will NOT necessarily be awarded maximum marks.
8. Answer question 4.4 on the diagram sheet provided on page 8.
   DETACH this page and insert it into your answer book.
9. Diagrams are NOT necessarily drawn to scale.
10. Write neatly and legibly.

QUESTION 1 **[25]**

1.1 Solve for x:

1.1.1 $x^2 - 6x = 7$ (3)

1.1.2 $3x^2 - 2x = 14$ (correct to TWO decimal place) (4)

1.1.3 $\sqrt{x-2} + x = 2$ (4)

1.1.4 $x^2 + 7x < 0$ (3)

1.1.5 $3^{x+3} - 3^{x+2} = 486$ (4)

1.2 Given: $x^2 + 2xy - 8y^2 = 0$

1.2.1 Determine the value(s) of the ratio $\frac{x}{y}$. (2)

1.2.2 Hence, determine the values of x and y if $x + y = 6$. (5)

QUESTION 2 **[17]**

2.1 If 3 is ONE root of the equation $2x^2 - 3x = -k$:

2.1.1 Determine the value of k. (2)

2.1.2 Calculate the value of the other root. (2)

2.2 Solve for x and y simultaneously:

$2 = x - 2y$ and $2 = x^2 - 2xy + 3y^2 - 2$ (6)

2.3 Simplify:

$$\sqrt[4]{\frac{3^x \cdot 9^{x+1}}{27^{x+2}}}$$

(Leave the answer with positive exponents ONLY) (4)

2.4 Determine the value(s) of m for which $2x^2 + mx = 5x + 8$, has two roots of equal magnitude BUT of opposite sign. (3)

QUESTION 3 **[19]**

3.1 The following sequence is given:

7 ; 3 ; –1 ; ...

3.1.1 Determine the general term of the sequence in the form $T_k = bk + c$. (2)

3.1.2 Which term in the sequence will be equal to –237? (2)

3.2 Given the following quadratic sequence:

0 ; p ; 2 ; 6 ; ...

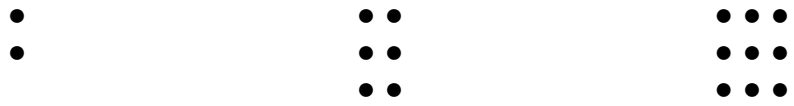
3.2.1 Calculate the value of p. (3)

3.2.2 Determine the expression for the n^{th} term of this sequence. (4)

3.2.3 Show why this sequence will NEVER have a negative term. (3)

3.3 Anne and Jerry look at the following patterns:

Pattern 1 Pattern 2 Pattern 3



Anne says she can derive the general formula for the number of dots by taking the number of columns in each pattern and multiplying it by the number of rows.
Jerry says if he increases the pattern number by one, squares that and then subtracts the pattern number increased by one he will get the general formula.
Who is correct? (Justify your answer) (5)

QUESTION 4 **[15]**

Given: $f(x) = \frac{-6}{x-3} - 1$

4.1 Determine the coordinates of the *y*-intercept of f. (1)

4.2 Calculate the coordinates of the *x*-intercept of f. (2)

4.3 Write down the equations of the asymptotes of f. (2)

4.4 Sketch the graph of f on the DIAGRAM SHEET PROVIDED clearly indicating ALL asymptotes and intercepts with the axes. (3)

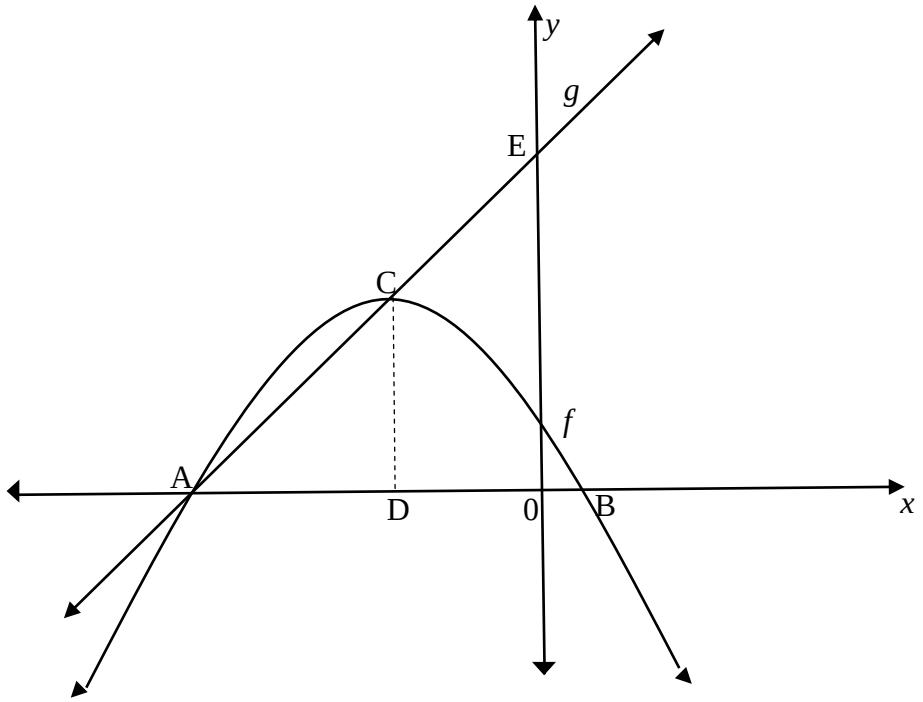
4.5 Determine the value(s) of x for which $f(x) > 0$. (1)

4.6 Calculate the average gradient of f between $x = -2$ and $x = 0$. (3)

4.7 ONE of the axes of symmetry of f is an increasing function.
Determine the equation of this axis of symmetry. (3)

QUESTION 5 **[17]**

The sketch below shows the graphs of $f(x) = -x^2 - 2x + 3$ and $g(x) = mx + c$.
The graph of g passes through point E on the y-axis and intersects the graph of f at point C (the turning point of f) and point A respectively.
Point A and point B are the x-intercepts of f, and line CD is the axis of symmetry of f.



5.1 Determine the coordinates of the turning point of f. (3)

5.2 Calculate the length of line AB. (3)

5.3 Determine the equation of g. (3)

5.4 Calculate the maximum length of line CE.
(Leave the answer in surd form.) (2)

5.5 Determine the value(s) of x for which:

5.5.1 $f(x) = g(x)$ (2)

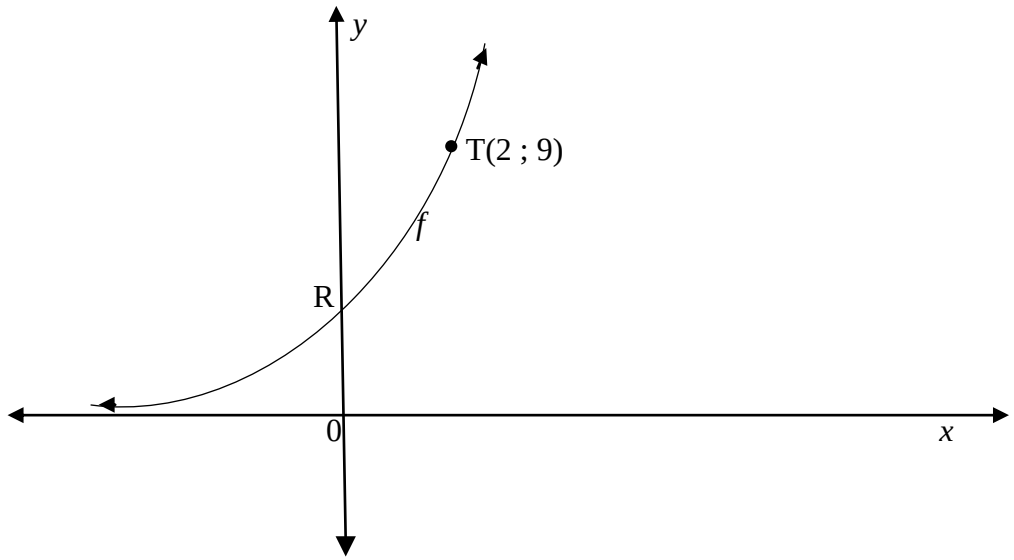
5.5.2 $f(x) \cdot g(x) < 0$ (2)

5.6 Sketch a neat graph of $y = ax^2 + bx + c$ in your ANSWER BOOK given that:

- $a < 0$
- $b < 0$
- $c < 0$
- $b^2 - 4ac = 0$ (2)

QUESTION 6 **[7]**

Sketched below is the graph of $f(x) = a^x$, $a > 1$. Point R is the y-intercept of f.
T (2 ; 9) is 'n punt op f.



6.1 Calculate the value of a. (2)

6.2 Write down the equation of the asymptote of f. (1)

6.3 Write down the range of f. (1)

6.4 Write down the coordinates of point R. (1)

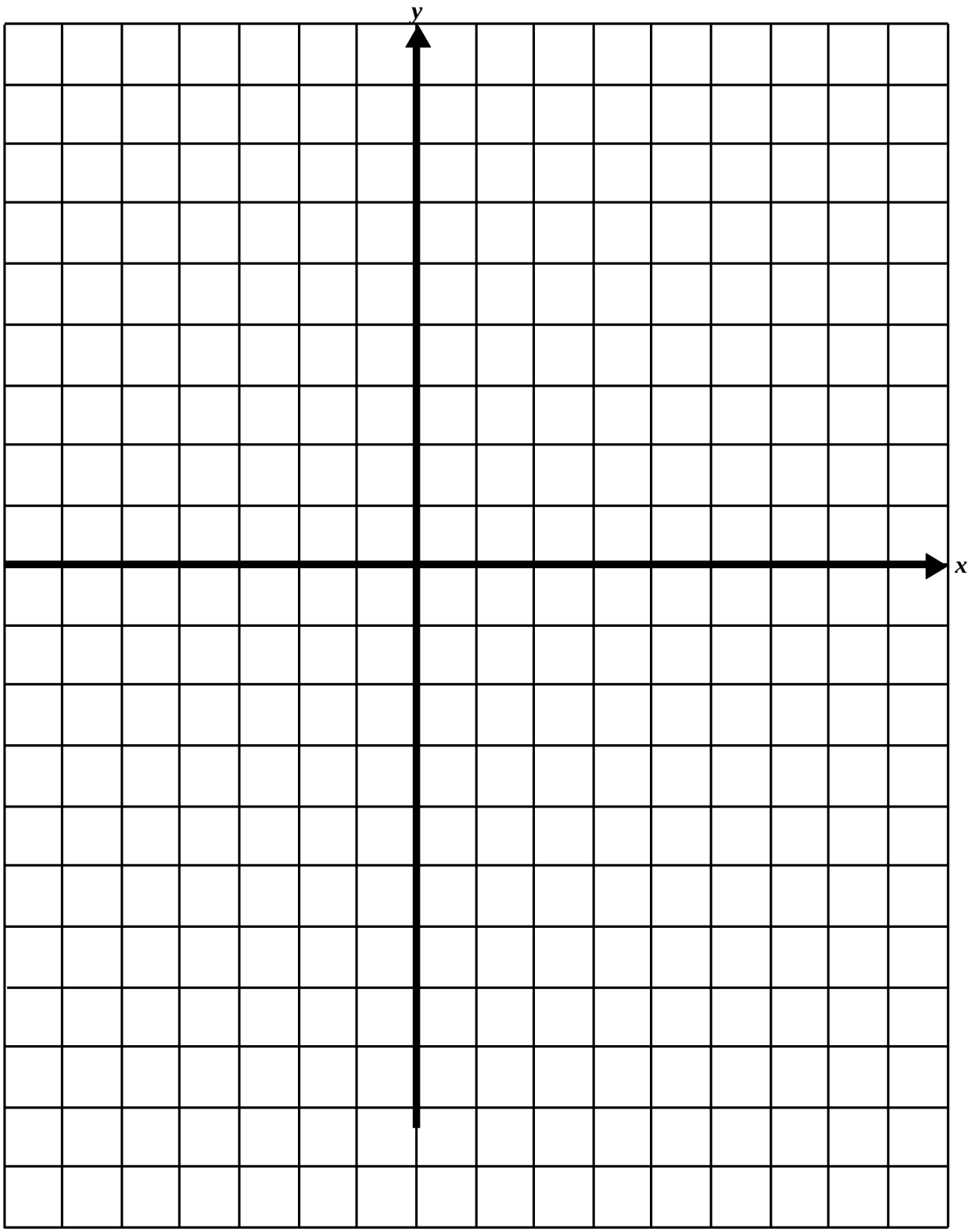
6.5 The graph of g is obtained by reflecting the graph of f in the y-axis.
Write down the equation of g. (1)

6.6 If $h(x) = 3f(x)$, write down the equation of the asymptote of h. (1)

TOTAL: 100

DIAGRAM SHEET **QUESTION 4.4**

NAME / SURNAME**:.....** Grade 11**:.....**



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