GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG DEPARTMENT OF EDUCATION

PROVINCIAL EXAMINATION

JUNE 2018

GRADE 11

MATHEMATICS

PAPER 1

TIME: 2 hours

MARKS: 100

8 pages

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(Paper 1)

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of **SIX** questions. Answer ALL the questions.
2. Cleary show ALL calculations, diagrams, graphs, et cetera, which were used in determining the answers.
3. An approved scientific calculator (non-programmable and non-graphical) must be used.
4. Answers should be rounded off to TWO decimal places, unless stated otherwise.
5. Number the answers according to the numbering on the question paper.
6. Diagrams are NOT necessarily drawn to scale.
7. Answers only will NOT necessarily be awarded full marks.
8. Write neatly and legibly IN BLUE or BLACK PEN.

QUESTION 1 **[26]**

1.1 Determine the value(s) of x for which the following expressions are defined.

1.1.1 $\sqrt{x-3}$ (1)

1.1.2 $\dfrac{1}{x-3}$ (1)

1.2 For which values of x will $k = \sqrt{\dfrac{3x-1}{x-1}}$ be non-real? (2)

1.3 Solve for x.

1.3.1 $(x + 1)\left(x - \dfrac{1}{2}\right) = 0$ (2)

1.3.2 $x^2 + x - 1 = 0$ (Correct to TWO decimal places) (4)

1.3.3 $x^2 - 2x + 1 \leq 0$ (2)

1.3.4 $x + 3\sqrt{x-1} = 1$ (5)

1.3.5 $3^x + 3^x + 3^x = 3^4$ (3)

1.4 Solve x and y simultaneously.

$x^2 + 2xy = 3y^2$

$2y - x = 6$ (6)

QUESTION 2 **[16]**

2.1 Simplify without the use of a calculator.

$3\sqrt{12}-\sqrt{75}$ (3)

2.2 WITHOUT the use of a calculator, show that:

2.2.1 $2^{2010} + 2^{2012} = 5.2^{2010}$ (2)

2.2.2 Hence calculate the value of $\frac{2^{2010}+2^{2012}+10}{2^{2009}+1}$ (4)

2.3 Simplify:

2.3.1 $x^{-1} + y^{-1}$ (3)

2.3.2 Hence determine the sum of the reciprocals of two variables if their sum is equal to 10 and their product is equal to 20. (4)

QUESTION 3 **[20]**

3.1 Consider the following number pattern:

$$1; -3; -9; -17; \ldots$$

3.1.1 Write down the next 2 terms of the sequence. (2)

3.1.2 Determine the general term for the number pattern. (4)

3.1.3 Determine the value of the 30^{th} term in the number pattern. (2)

3.1.4 Which term in the pattern will have a value of -7479? (3)

3.2 Consider the following continuous pattern below that emerges when odd numbers are added.

$$1 = 1$$

$$1 + 3 = 4$$

$$1 + 3 + 5 = 9$$

$$1 + 3 + 5 + 9 + 7 = 16$$

Hence calculate the value of the pattern:

$$1 + 3 + 5 + 7 + \ldots + 1001$$ (6)

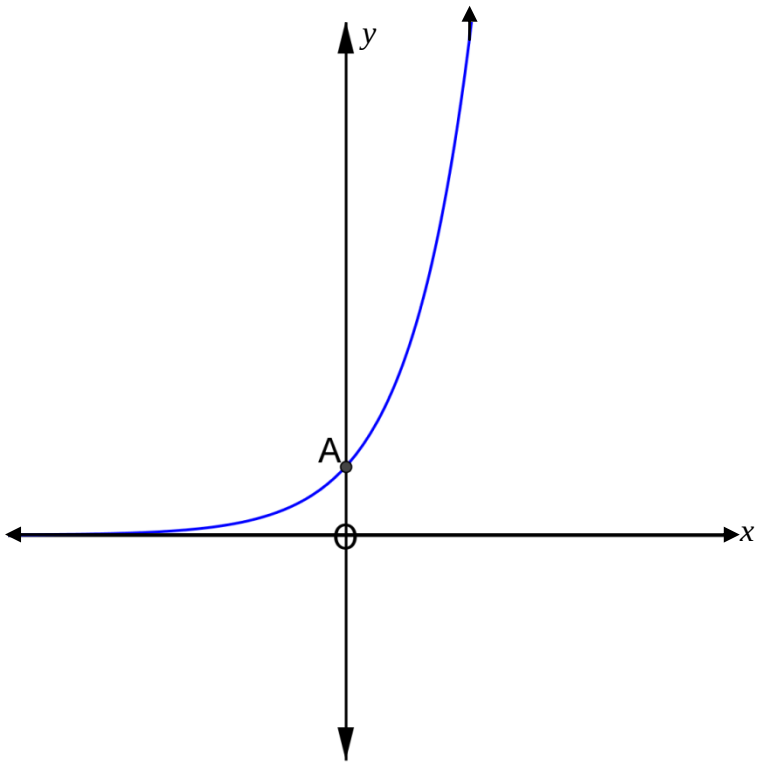
3.3 A grade 10 Mathematics test consists of 100 multiple choice questions.
A candidate answers $5n - 2$ of these questions in the designated time.

How many questions did the candidate answer? (3)

QUESTION 4 **[10]**

The graph of $f(x) = 3^x$, is drawn below with $x \in \mathbb{R}$.

Point A is the *y*-intercept of the graph.



4.1 Write down the coordinates of point A. (2)

4.2 A new graph *g* is formed when the graph of *f* is reflected in the *y*-axis.

4.2.1 Write down the equation of *g*. (2)

4.2.2 Sketch the graph of *g* in your ANSWER BOOK. Clearly indicate all intercepts with the axes. (3)

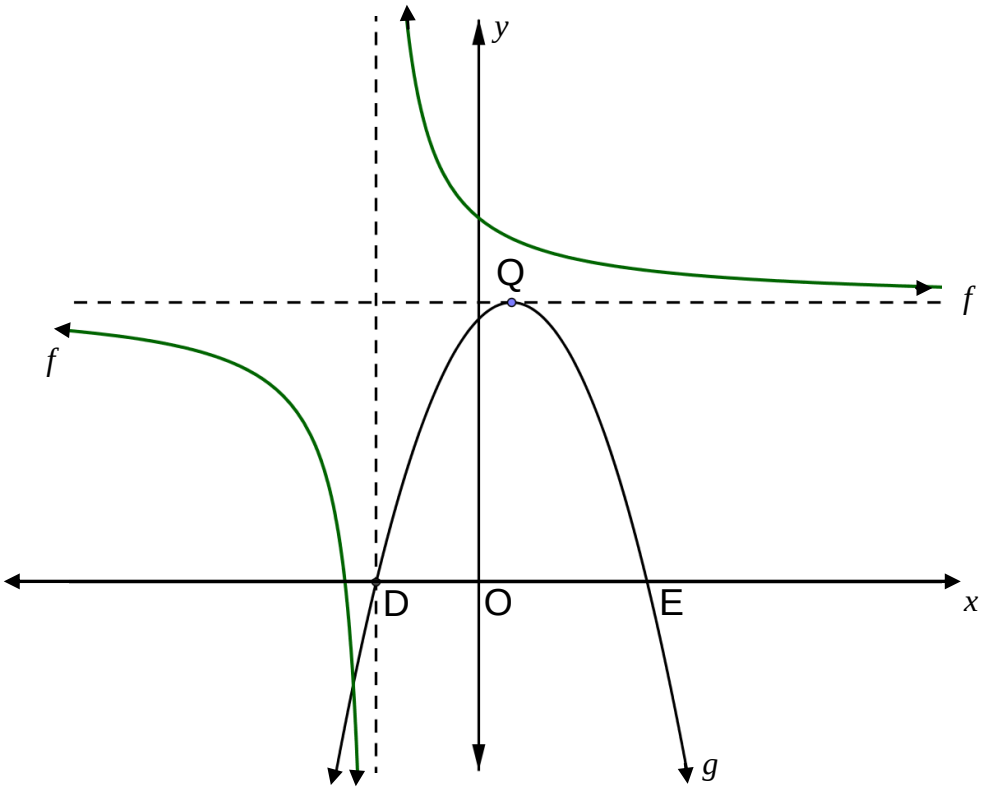
4.3 The graph of $k(x) = 3^{-x+1} + 2$ is formed as the result of a transformation of the graph of *f*.

Describe the transformation of the graph of *f* to the graph of *k*. (3)

QUESTION 5 **[20]**

The graphs of $g(x) = -2x^2 + 4x + 16$ and $f(x) = \frac{12}{x+p} + q$ are drawn below.

Point Q is the turning point and point D and point E are the x- intercepts of g.
The horizontal and vertical asymptotes of f intersect the graph of g at point Q and point D respectively.



5.1 Show that g can be represented by the equation $g(x) = -2(x-1)^2 + 18$. (4)

5.2 Hence, or otherwise, determine the coordinates of point Q. (2)

5.3 Calculate the coordinates of point D and point E. (4)

5.4 Determine the equations of the asymptotes of f and state the value of p and q. (4)

5.5 Determine for which values of x the graph of g will decrease. (2)

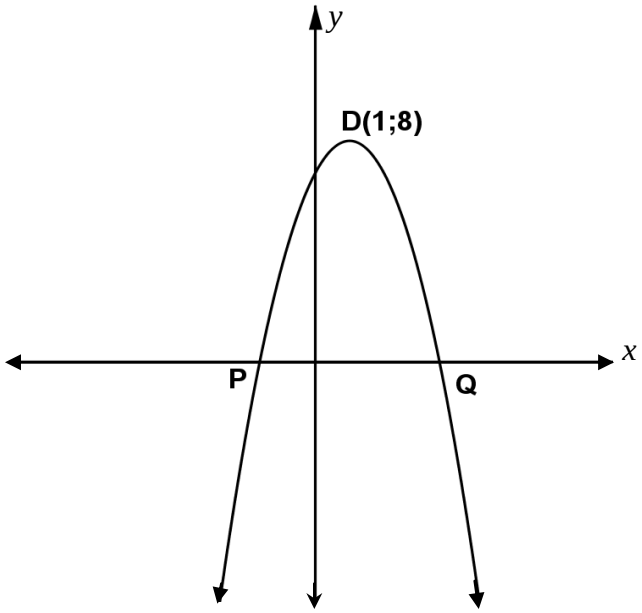
5.6 Write down the range of g. (2)

5.7 Write down the domain of f. (2)

QUESTION 6 **[8]**

The sketch below represents the graph of $f(x) = -2x^2 + bx + c$, where point D(1 ; 8) is the turning point of f.

The graph of f intersects the x- axis at point P and point Q respectively.



6.1 Determine the values of b and c. (5)

6.2 The graph of g represents f when f is translated 2 units left and 3 units up. Determine the equation of g. (3)

TOTAL: 100

END