



GRADE 12

TERM 2

MATHEMATICS

JUNE EXAMINATION

PAPER 1

Time allocation: 3 hours

Total Marks: 150

Date: June 2019

INSTRUCTIONS:

1. This question paper consists **EIGHT** of questions. Answer **ALL** the questions.
2. Answer Section A on the folio paper provided and Section B in the spaces provided.
3. Number the answers correctly according to the numbering system used in this question paper.
4. A non-programmable and non-graphic calculator may be used, unless stated otherwise.
5. A **DIAGRAM SHEET** has been included at the end of the paper.
6. **ALL** calculations and steps must be shown clearly.
7. All **FINAL** answers must be rounded off to **TWO** decimal places, unless stated otherwise.
8. It is in your own interest to write neatly and legible.
9. Good luck!

Question 1 [25 marks]:

1.1 Solve for x . Leave answers in simplest surd form if necessary.

1.1.1 $(2x - 1)(x + 5) = 0$ (2)

1.1.2 $x = 1 + \frac{1}{x}$ (4)

1.1.3 $x(x - 2) \geq 8$ (3)

1.2 Solve for x and check for a valid solution

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

1.3 Solve for x and y simultaneously

$2^x + 5^y = 9$ and $2^{x-1} + 5^{y+2} = 9$ (7)

1.4 The solutions to a quadratic equation is:

$x = \frac{3 \pm \sqrt{4-8p}}{4}$ where $p \in Q$.

Determine the value(s) of p such that:

1.4.1 The roots of the equation are equal. (2)

1.4.2 The roots of the equation are non-real. (2)

Question 2 [10 marks]

2.1 The general term of an arithmetic sequence is $T_n = 6 + 4k$

2.1.1 Determine the value of the 16th term. (2)

2.1.2 Determine the sum of the first 16 terms. (2)

2.2 The 6th term of a geometric sequence 486 and the 3rd term is 18.

2.2.1 Determine the value of the first three terms in the sequence. (4)

2.2.2 Which term in the sequence will have a value of 39 366? (2)

Question 3 [28 marks]

3.1 Given the arithmetic sequence 72; 68; 64; 60... (6)

Determine which term in the sequence will be the **FIRST** to be negative.

3.2 Solve for a and b if: (6)

$$\sum_{p=5}^6 a(2p - 3) = 16b \quad \text{and} \quad a^2 + 1 = 4a - 2b$$

- 3.3 Given: $5\left(\frac{1-k}{3}\right) + 10\left(\frac{1-k}{3}\right)^2 + 20\left(\frac{1-k}{3}\right)^3 + \dots$
- 3.3.1 For which values of k will the series converge? (4)
- 3.3.2 If $k = 2$ determine S_{∞} . (3)
- 3.4 The following sequence forms a quadratic number pattern:
 $-3; -2; -3; -6; -11; \dots$
- 3.4.1 The first differences of the above sequence also form a sequence. (3)
Determine an expression for the general term of the first differences.
- 3.4.2 Calculate the first difference between the 35th and the 36th term of the quadratic sequence. (1)
- 3.4.3 Determine an expression of the n^{th} of the quadratic sequence. (4)
- 3.4.4 Explain why the sequence of the numbers will never contain a positive term. (1)

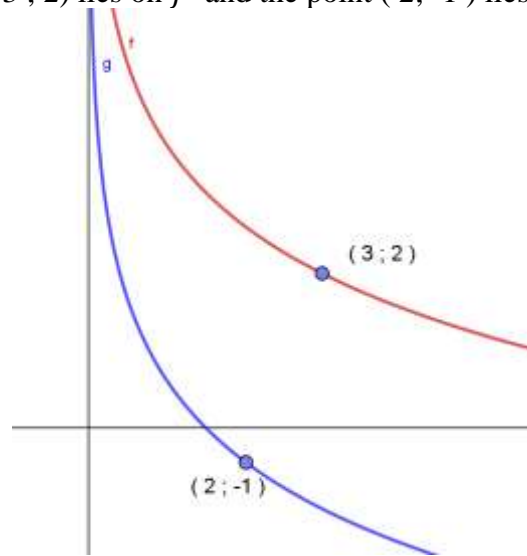
Question 4 [13 marks]

Given: $g(x) = \frac{3}{x-2} + 1$

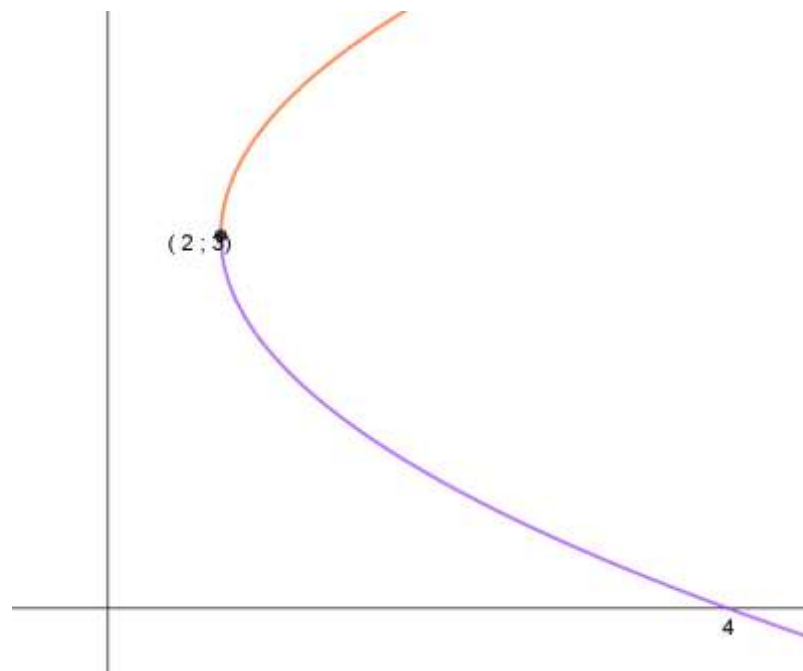
- 4.1 Write down the equations of the asymptotes of $g(x)$ (2)
- 4.2 Determine the values of the x – and y – intercepts of $g(x)$. (4)
- 4.3 Sketch the graph of g on DIAGRAM SHEET 1. Show all necessary points and equation clearly on your graph. (3)
- 4.4 Determine the equation of the axis of symmetry to g with a negative gradient. (2)
- 4.5 Write down the domain for h if $h(x) = g(x + 3)$. (2)

Question 5 [14 marks]

- 5.1 Shown alongside are the graphs of $f(x) = \frac{k}{x}$ where $x > 0$ and $g(x) = \log_p x$.
 The point $(3; 2)$ lies on f and the point $(2; -1)$ lies on g .



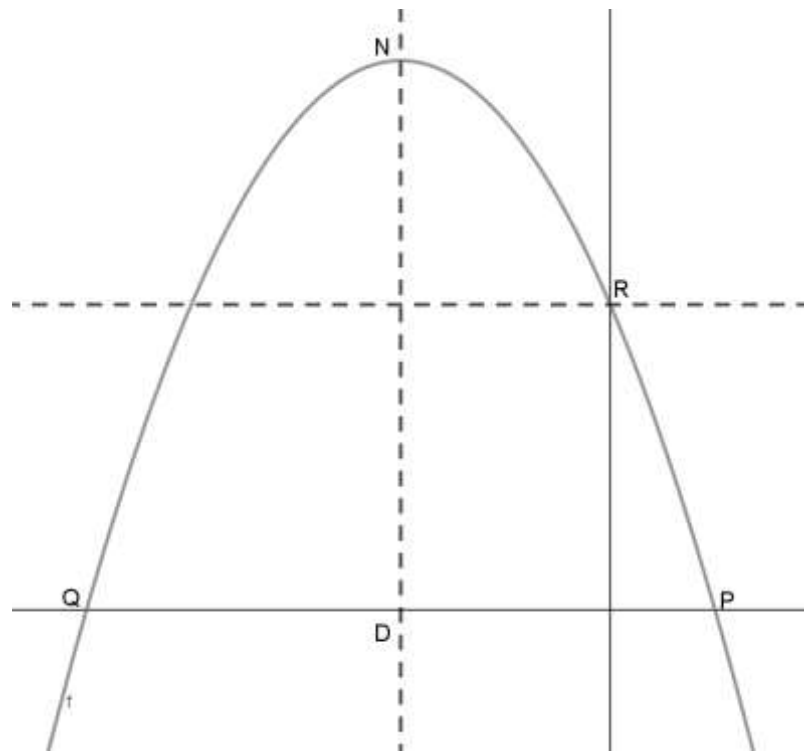
- 5.1.1 Determine the values of p and k . (4)
 5.1.2 Write down the equation of g^{-1} in the form of $y = \dots$ (2)
 5.1.3 Sketch the graph of g^{-1} , on DIAGRAM SHEET 2, showing coordinates of one point. (2)
- 5.2 The graph of f^{-1} is shown below, with turning point $(2; 3)$ and an x -intercept of $(4; 0)$.



- 5.2.1 Write down the equation of f . (4)
 5.2.2 Restrict the domain of f^{-1} so that the graph is a function. (2)

Question 6 [13 marks]

Sketch below the graph of $f(x) = -x^2 - 4x + 5$



- 6.1 Calculate the length of PQ. (4)
- 6.2 Write down the coordinates of R. (1)
- 6.3 Calculate the length of DN. (4)
- 6.4 Determine the average gradient of f between $x = -4$ and $x = -1$. (2)
- 6.5 Determine the coordinates of the turning point of h if $h(x) = f(x - 2) + 1$. (2)

Question 7 [37 marks]

- 7.1 Use first principles to determine $f'(x)$ for the curve of $f(x) = 3x^2 + 3x$. (5)
- 7.2 Determine:
- 7.2.1 $f'(x)$ if $f(x) = (x + 3)(x - 4)$ (3)
- 7.2.2 $D_x[2\sqrt{x} - \frac{5}{x^2}]$ (4)
- 7.2.3 $\frac{dy}{dx}$ if $y = \frac{-6x^5 - 3x^2}{x^3}$ (4)
- 7.2.4 $\lim_{x \rightarrow -4} \frac{2x^2 + 9x - 5}{2x - 1}$ (3)

7.3 Given: $f(x) = x^3 - 4x^2 - 11x + 30$

7.3.1 Prove that $x - 2$ is a factor of $f(x)$. (2)7.3.2 Hence, calculate the x -intercepts of $f(x)$. (4)

7.3.3 Determine the coordinates of the stationary points. (5)

7.3.4 Sketch the graph of $f(x)$. (4)

7.3.5 Calculate the point of inflection. (3)

Question 8 [10 marks]

8.1 Given the graph of $f'(x) = -x^2 - 2x + 3$

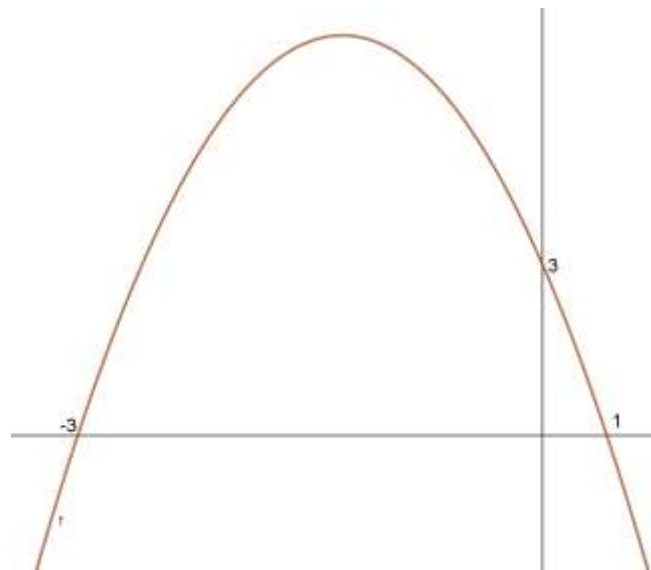
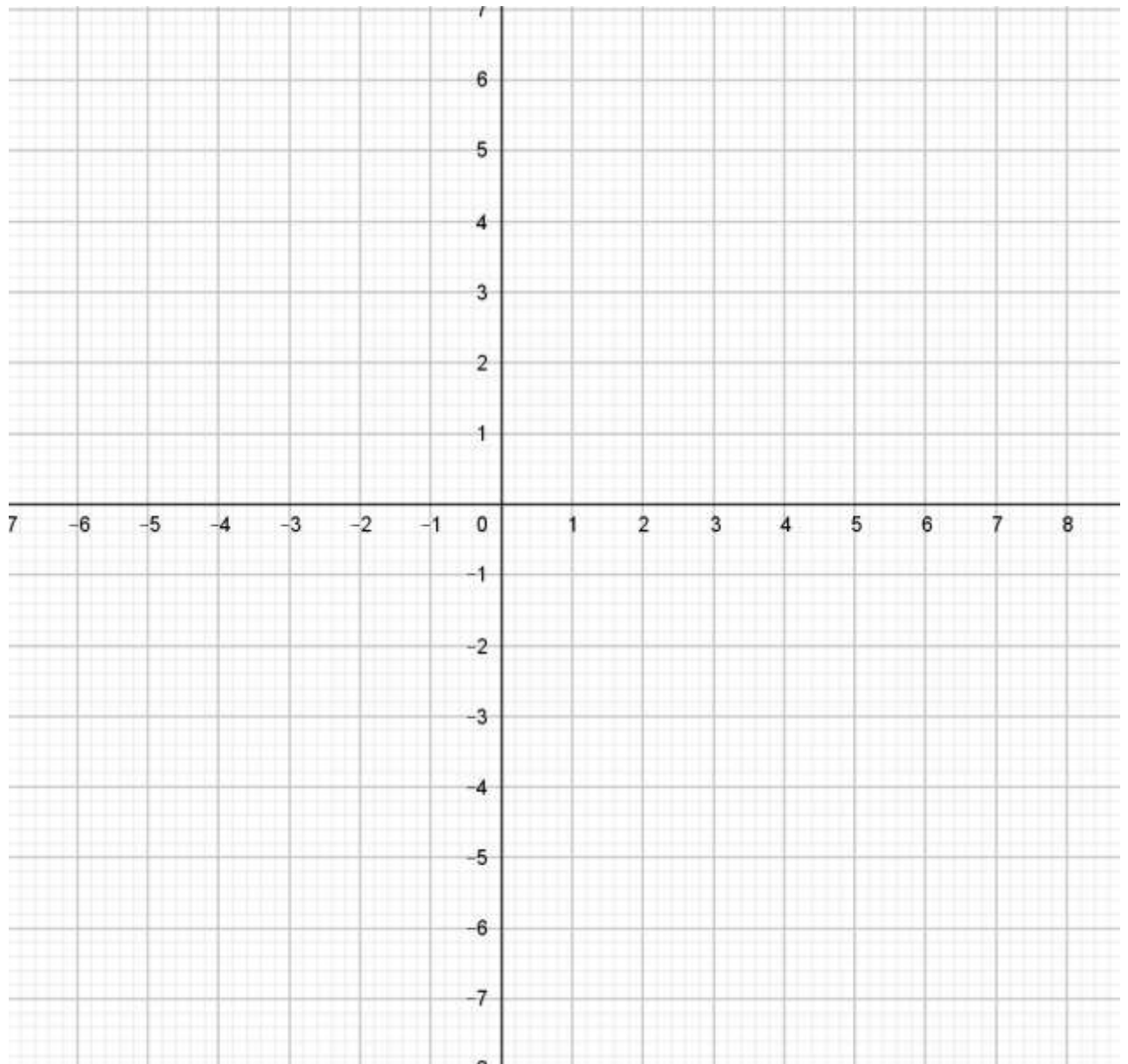
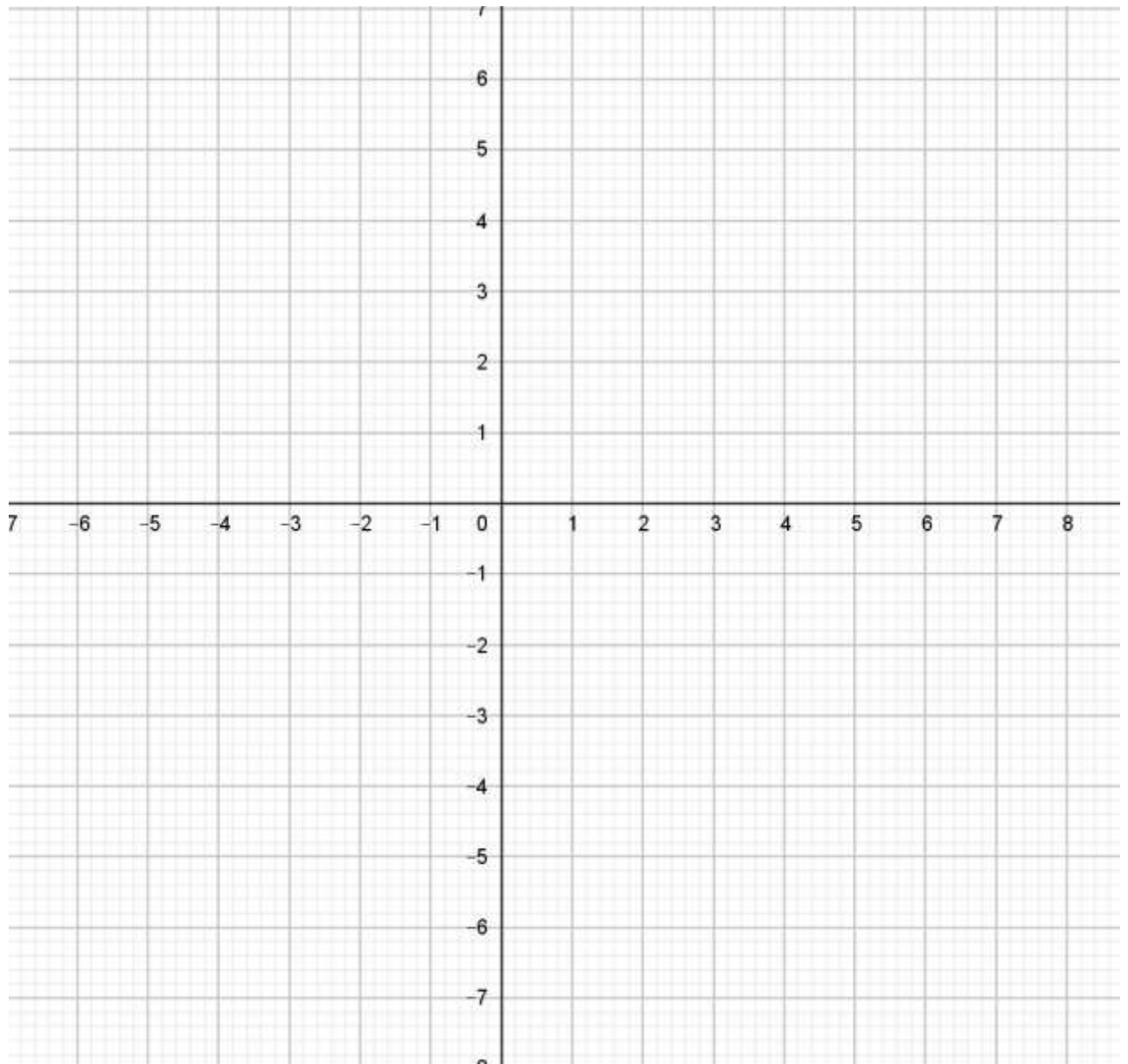
8.1.1 For which values of x is f increasing? (2)8.1.2 Determine the x -values of the turning point of f . (2)8.2 Determine the equation of the tangent to $g(x) = x + \frac{4}{x^2}$ at $x = 1$ (6)**TOTAL: 150**

DIAGRAM SHEET:

Question 4



Question 5.1.3



Question 8.3.4

