



**GAUTENG DEPARTMENT OF EDUCATION**  
**PROVINCIAL EXAMINATION**  
**JUNE 2016**  
**GRADE 11**

**MATHEMATICS**  
**(PAPER 1)**

**TIME: 2 hours**

**MARKS: 100**

**7 pages + 2 answer sheets**

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PROVINCIAL EXAMINATION****MATHEMATICS  
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**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

- 1 This question paper consists of SIX questions.
- 2 Answer ALL questions.
- 3 Clearly show ALL calculations, diagrams, graphs, etc., which were used in determining your answers.
- 4 An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
- 5 Answers should be rounded-off to TWO decimal places, unless stated otherwise.
- 6 Number your answers according to the numbering system used in this question paper.
- 7 Diagrams are NOT necessarily drawn to scale.
- 8 Answer sheets for answering QUESTION 5.5 and QUESTION 6.3 are provided at the end of the question paper. Write your name in the spaces provided and submit them together with your ANSWER BOOK.
- 9 Answers only will not necessarily be awarded full marks.
- 10 Write neatly and legibly.

**QUESTION 1**

1.1 The equation  $(x - 2)(3x + 4) = k$

Solve for  $x$  as  $k = 0$  (2)

1.2 Solve for  $x$ :

1.2.1  $\sqrt{2 - x} = x + 4$  (5)

1.2.2  $2x(x - 3) = 1$  (correct to one decimal place) (4)

1.2.3  $\frac{x^2 + 4x + 3}{x - 1} > 0$  (4)

1.3 Solve for  $x$ :

$2x^2 - 3x = 8$  (by completing the square) (5)

**[20]**

**QUESTION 2**

2.1 Simplify:

$$\frac{3 \cdot 3^x - 4 \cdot 3^{x+2}}{3^x - 3^{x+1}} \quad (4)$$

2.2 Simplify WITHOUT the use of a calculator:

2.2.1  $\frac{\sqrt{5}}{\sqrt{5} + 2} + \frac{10}{\sqrt{5}}$  (4)

2.2.2  $\left(\frac{\sqrt{7^{2011}} - \sqrt{7^{2009}}}{\sqrt{7^{2008}}} + \sqrt{7}\right)^2$  (4)

2.3 Solve simultaneously for  $x$  and  $y$ :

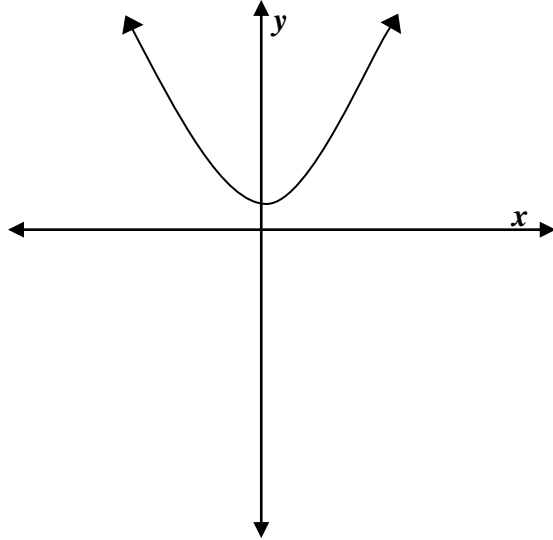
$2^x \cdot 4^y = 1$  and  $(4^y)^x = \frac{1}{16}$  (6)

**[18]**

**QUESTION 3**

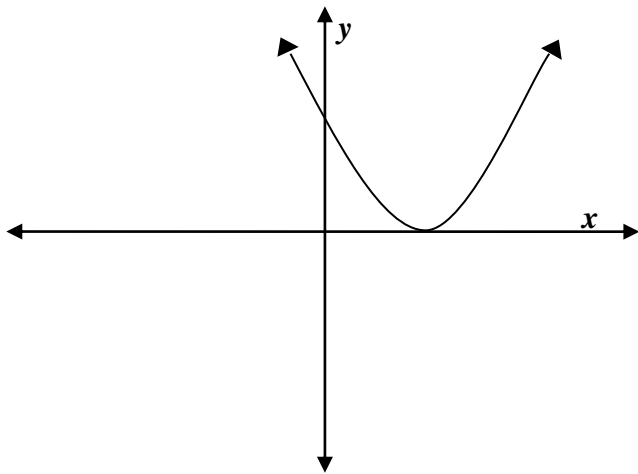
3.1 Determine the nature of the roots of the following graphs.

3.1.1



(2)

3.1.2



(2)

3.2. Show that the roots of the equation  $kx^2 + (2k - 1)x = -k + 1$  are rational for all rational value(s) of  $k$ .

(4)

**[8]**

**QUESTION 4**

4.1  $T_k = 3k^2 - 4$  is the  $k_{th}$  term of a sequence.

4.1.1 Write down the first THREE terms of the sequence. (3)

4.1.2 Determine the value of  $k$  if  $T_k = 71$ . (3)

4.2 Given the number pattern below:

0; 5; 12; 21; ...

4.2.1 What kind of number pattern is being illustrated? Substantiate your answer. (2)

4.2.2 Determine the general term for this number pattern. (4)

4.3 Study the pattern below:

Row 1:  $4^2 - 3^2 + 2^2 - 1^2 = 10$

Row 2:  $5^2 - 4^2 + 3^2 - 2^2 = 14$

Row 3:  $6^2 - 5^2 + 4^2 - 3^2 = 18$

Row 4: (.....)

Row 20: (.....)

Row  $n$ :  $a^2 - b^2 + c^2 - d^2 = T_n$

4.3.1 Complete the patterns for Row 4 and Row 20. (2)

4.3.2 Determine the values of  $a$ ;  $b$ ;  $c$ ;  $d$ ; and  $T_n$  (in the  $n$ th Row) in terms of  $n$ .

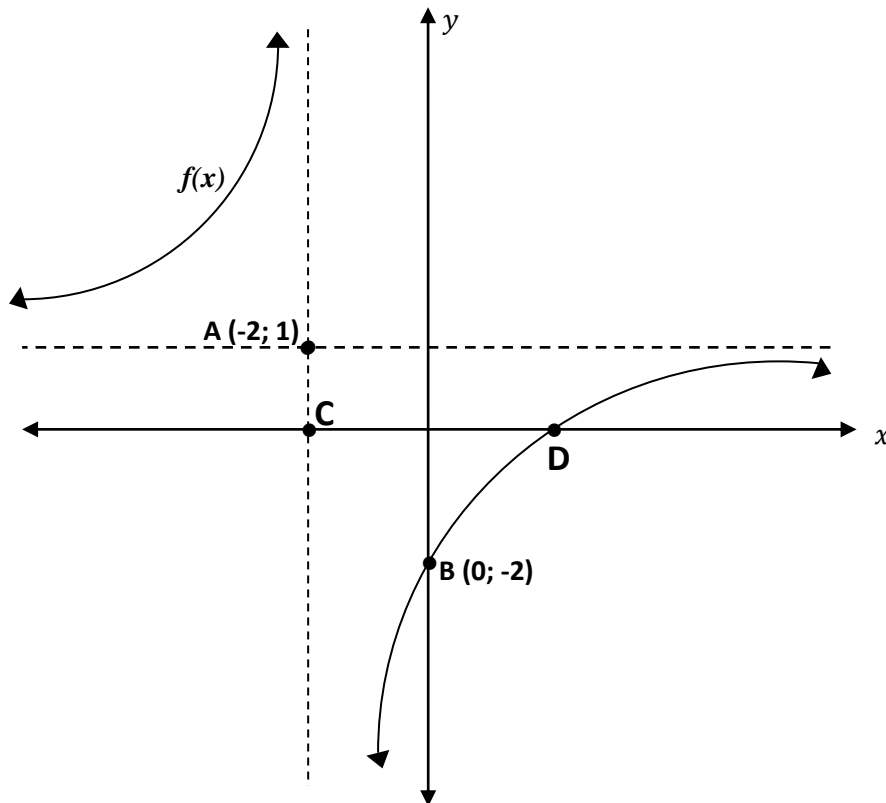
Simplify for  $T_n$  as far as possible. (3)

**[17]**

**QUESTION 5**

In the diagram below  $f(x) = \frac{k}{x-p} + q$  where, A (-2; 1) and B (0;-2) are points on the graph.

It is further given that  $g(x) = 2^{x+2}$ .



- 5.1 Derive the equations of the asymptotes of  $f(x)$ . (2)
- 5.2 Determine the equation of  $f(x)$ . (3)
- 5.3 Calculate the coordinates of Point D. (4)
- 5.4 Determine the equation of the function  $h(x) = ax^2 + bx + c$  which passes through the Points B; C and D where Points C and D are the  $x$ -intercepts of the graph. (5)
- 5.5 On ANSWER SHEET 1, draw a neat sketch of  $g(x) = 2^{x+2}$ . (3)  
Clearly show all the intercepts and asymptotes of the graph.
- 5.6 Derive the equation of  $g(x - 3)$ . (2)
- 5.7 Determine the range of  $f(x)$ . (1)

[20]

**QUESTION 6**

During the 2015 Cricket World Cup, South African captain AB de Villiers hit the ball with great force. After leaving his bat, the height of the ball, above the ground in metres, after  $x$  seconds, is expressed as  $h(x) = -x^2 + 4x$ .



6.1 Determine the domain of  $h(x)$ . (2)

6.2 Re-write this equation in the form  $h(x) = a(x - p)^2 + q$ . (3)

6.3 Sketch the graph of  $h(x)$  on ANSWER SHEET 2.

Clearly show all the significant points. (4)

6.4 The graph of  $h(x)$  is moved horizontally by five units to the right.

Determine the equation of this new graph in the form of  $y = ax^2 + bx + c$ . (3)

6.5 Determine the equation for  $k(x)$ , if  $k(x)$  is the reflection of  $h(x)$  in the line  $x = 0$ . (2)

6.6 The average gradient of the graph  $p(x) = \frac{1}{2}x^2$  is given as  $\frac{p(-3) - p(-1)}{-3 - (-1)}$  between the points  $x = -3$  and  $x = -1$ .

Determine the value of the average gradient. (3)

**[17]**

**TOTAL: 100**

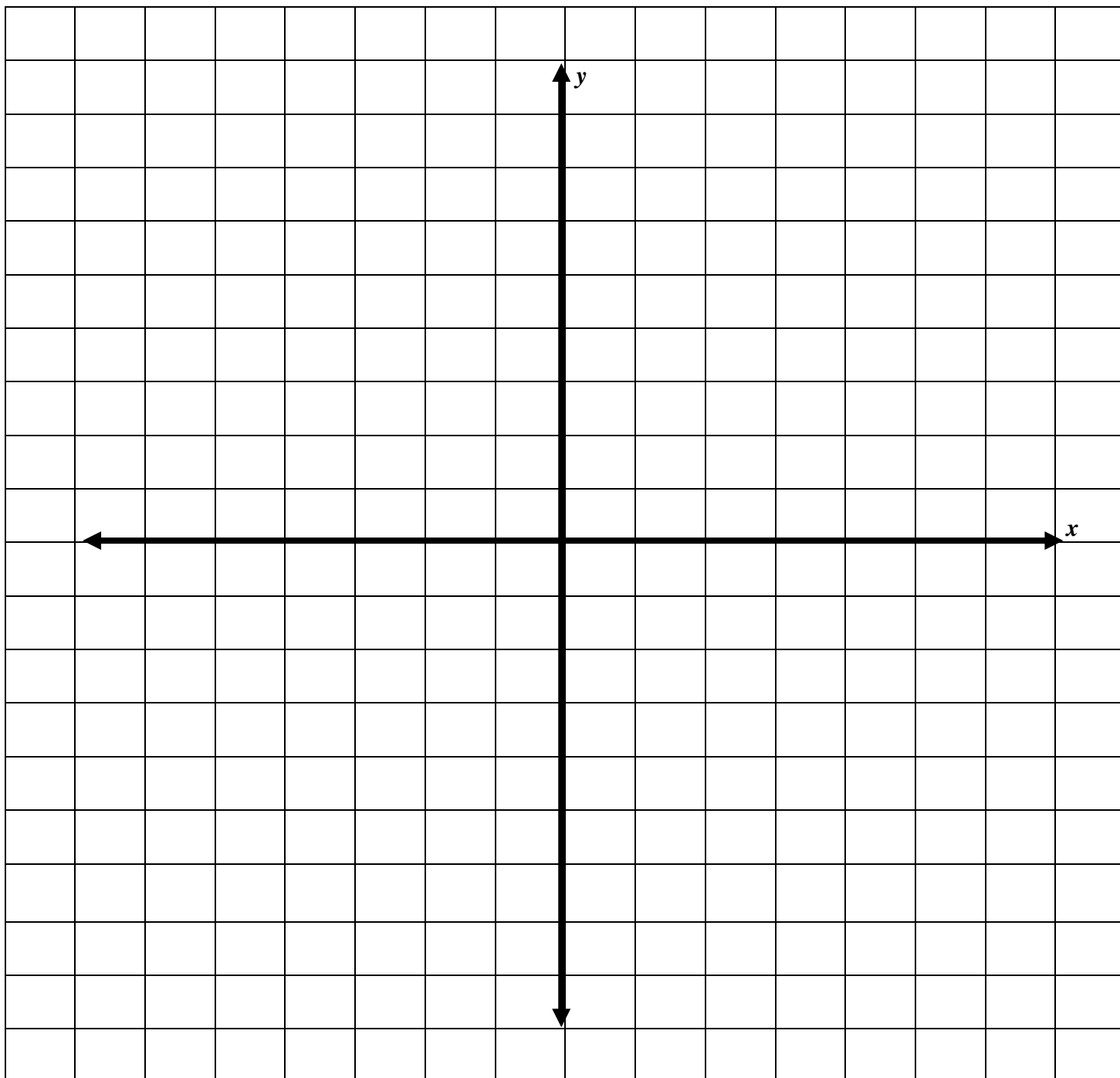
**ANSWER SHEET 1**

**QUESTION 5.5**

Detach this page and insert it into the ANSWER BOOK.

Name and Surname: \_\_\_\_\_

Grade: \_\_\_\_\_





**ANSWER SHEET 2**

**QUESTION 6.3**

Detach this page and insert it into the ANSWER BOOK.

Name and Surname: \_\_\_\_\_

Grade: \_\_\_\_\_

