

Narne and Surname

Grade/Class

11/

Mathematics Teacher:

2018

GRADE 11

MATHEMATICS

June Examination Paper 1

Marks

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Time

2 HRS

INSTRUCTIONS

1. Illegible work, in the opinion of the marker, will earn zero marks.
 2. Number your answers clearly and accurately, exactly as they appear on the question paper.
 3. NB - Start each QUESTION at the *top of a page*.
 - Leave *2 lines* open between each of your answers.
 4. NB Fill in the details requested on the front of this Question Paper and *staple* your submission in the following manner :
 - Question Paper (on top)
 - Answers and graph sheet (below).
 5. Employ relevant formulae and show all working out. Answers alone may not be awarded full marks.
 6. (Non-programmable and non-graphical) Calculators may be used, unless their usage is specifically prohibited.
 7. Round off answers to 2 decimal places, where necessary, unless instructed otherwise.
 8. If (Euclidean) Geometric statements are made, reasons must be stated appropriately.
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QUESTION 1: [36 marks]

1.1. Solve for x .

1.1.1. $x^2 - 3x = 0$ (2)

1.1.2. $\frac{2x+3}{3} = x^2$ (4)

1.1.3. $-3x^2 \leq 2x - 8$ (4)

1.1.4. $\frac{4x+1}{x+1} = \frac{x+1}{x-1}$ (4)

1.1.5. $2\sqrt{2x-1} + 4 = 2x$ (4)

1.1.6. $3^{x+1} + 3^x = 36$ (3)

1.1.7. $x^3 - x^{\frac{3}{2}} - 2 = 0$ (4)

1.2. Solve for x and y

$2y - x = -3$ and $3x^2 - 5xy = 16y + 24$ (6)

1.3.1. Show that $\frac{4^{n+1} \cdot 8^{2n-3}}{16^{2n-1}} = \frac{1}{8}$ (3)

1.3.2. Hence, solve for x :

$$\frac{4^{n+1} \cdot 8^{2n-3}}{16^{2n-1}} = 3^{-x+4} \quad (2)$$

QUESTION 2: [8 marks]

CALCULATORS MAY NOT BE USED IN THIS QUESTION:

Simplify fully:

2.1. $(\sqrt{18} + \sqrt{8} - 2\sqrt{50})^2$ (3)

2.2. $a^{\frac{1}{2}} \cdot \sqrt[3]{a^2} \cdot \left(a^{\frac{1}{12}}\right)^{-2}$ (3)

2.3. $2x^{\frac{1}{2}} (3x^{\frac{1}{2}} - x^{\frac{-1}{2}})$ (2)

QUESTION 3: [10 marks]

- 3.1. The roots of a quadratic equation are given as $x = \frac{3 \pm \sqrt{20-4k}}{4}$ where $k \in Q$
Determine the values of k for which the roots are non-real (2)
- 3.2. Without solving the equation $3x^2 + 5x - 2 = 0$, determine the nature of its roots (3)
- 3.3. For which value(s) of p , where $p \in R$, will
 $px^2 + 4x = x^2 - p + 1$ have equal roots (5)

QUESTION 4: [8 marks]

Consider the number pattern -1 ; -7 ; -11 ; -13

- 4.1. Determine the general term T_n (4)
- 4.3. Now consider the sequence -1 ; 10 ; -7 ; 17 ; -11 ; 24 ; -13 ; 31 ; ...
For this sequence, determine T_{524} (4)

QUESTION 5: [4 marks]

Given: 4 ; x ; $2x + 1$; 28 ; ..

If the given sequence is quadratic, determine the value of x (4)

QUESTION 6: [10 marks]

Given $f(x) = \frac{-14-3x}{x+2}$

- 6.1. Show that $f(x)$ can be written as $f(x) = -\frac{8}{x+2} - 3$ (1)
- 6.2. Write down the equations of the asymptotes. (2)
- 6.3. Determine the x - and y - intercepts (3)
- 6.4. Sketch the graph of $f(x)$, clearly showing all intercepts and asymptotes. (1)
- 6.5. If $y = x + k$ is a line of symmetry, determine the value of k (1)
- 6.6. If $A(-4 ; 6)$ is reflected in the line determined in question 6.5 to become A' ,
Determine the coordinates of A' . (2)

QUESTION 7: [8 marks]

Given $h(x) = 2 \cdot 3^x - 6$

7.1. Sketch the graph of $h(x)$ clearly showing all asymptotes and intercepts (4)

7.2. Is $h(x)$ an increasing or decreasing function? (1)

7.3. State the range of $h(x)$ (1)

7.4. If $h(x)$ is moved

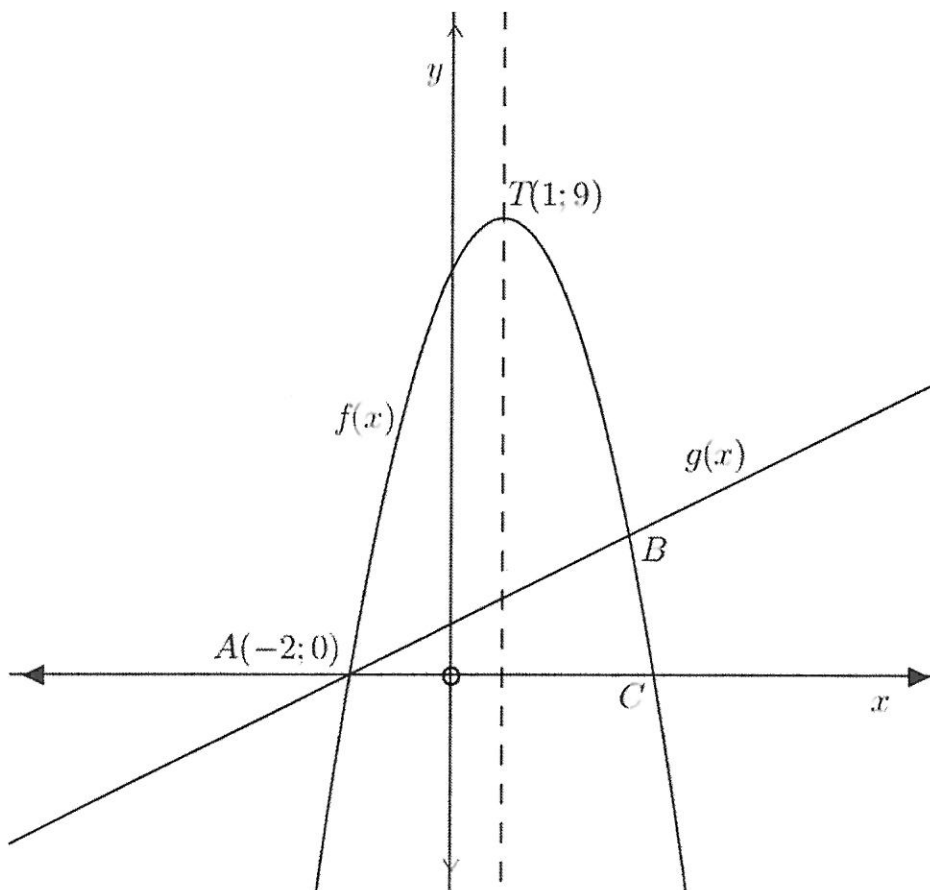
- 5 units vertically downwards and
- 4 units horizontally to the right to become $g(x)$

State the equation of $g(x)$ in y - form (2)

QUESTION 8: [16 marks]

The graphs of $f(x) = a(x - p)^2 + q$ and $g(x) = \frac{1}{2}x + 1$ are sketched below.

The turning point $T(1; 9)$ is shown, and one of the x intercepts at A is -2 .



Determine:

- 8.1. the equation of $f(x)$, showing that it will be $f(x) = -x^2 + 2x + 8$ (4)
- 8.2. the co-ordinates of B , the point of intersection of $f(x)$ and $g(x)$ (5)
- 8.3. the values of x for which $f(x) \geq g(x)$ (1)
- 8.4. the average gradient of f between $x = -2$ and $x = 1$ (2)
- 8.5. the equation of the reflection of $f(x)$ in the line $y = 0$.
Leave your answer in $y -$ form. (2)
- 8.6. For which values(s) of k will $-x^2 + 2x = k + 3$ have two, unequal, positive real roots? (2)