Narne and Surname

Grade/Class   11/..........   Mathematics Teacher: …..…....…...……....

2018

GRADE 11
MATHEMATICS
June Examination Paper 1

Marks

$$\frac{}{100}$$

Time   2 HRS

INSTRUCTfONS

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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.

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

    $2y - x = -3 \ \text{and} \ 3x^2 - 5xy = 16y + 24$ (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:

    $\frac{4^{n+1} \cdot 8^{2n-3}}{16^{2n-1}} = 3^{-x+4}$ (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. $2x^{\frac{1}{2}}\left(3x^{\frac{1}{2}} - x^{\frac{-1}{2}}\right)$ (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 $k \epsilon Q$
    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 Tn (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 $A\grave{}$,

    Determine the coordinates of $A\grave{}$.   (2)

[8 marks]

Given $h(x) = 2.3^x - 6$

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)

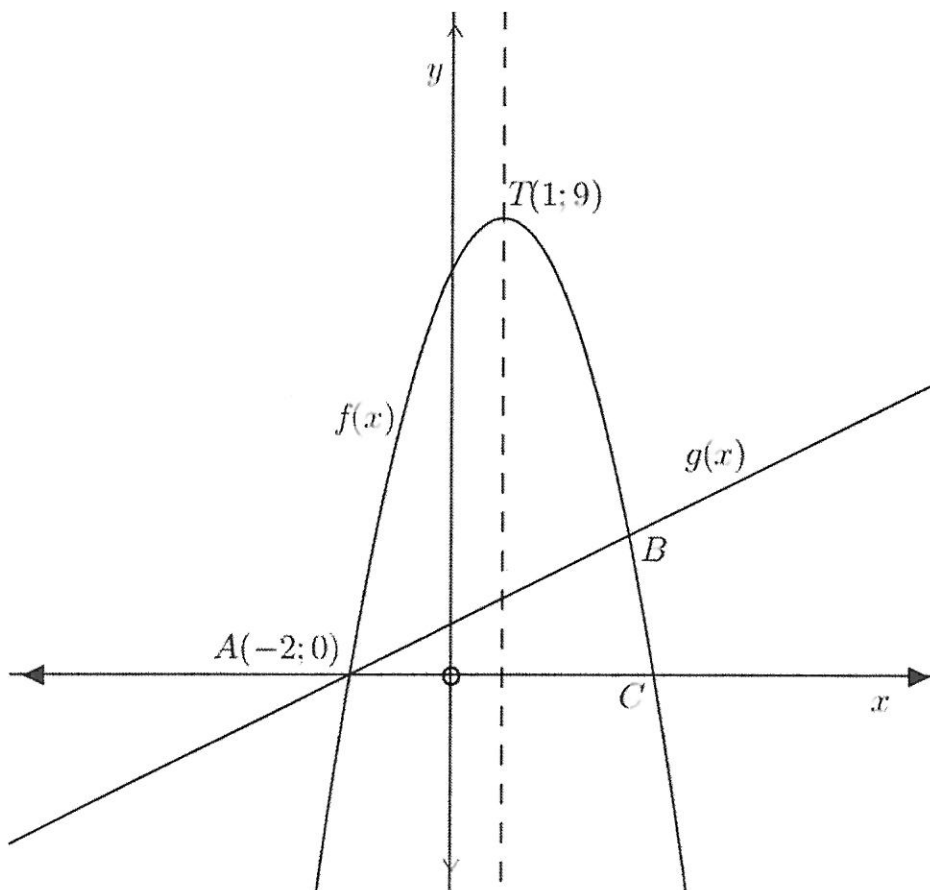7.3.   State the range of $h(x)$ (1)

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.

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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)