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Herzlia High	Rondebosch Boys'	St Mary's DSG Kloof	Wynberg Secondary

**MATHEMATICS PAPER 1
GRADE 11
JUNE 2019**

Time: 2 Hours

Total:100

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 8 pages plus a data sheet. Please check that your question paper is complete.
 2. Read the questions carefully.
 3. Answer all questions, showing all the necessary working.
 4. Please note that diagrams are not necessarily drawn to scale.
 5. Approved non-programmable, non-graphing calculators may be used, unless otherwise stated.
 6. Round off your answers to TWO decimal digits where necessary, unless otherwise stated.
 7. Ensure that your calculator is in DEGREE mode.
 8. It is in your own interest to write legibly and to present your work neatly.
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QUESTION 1

(a) Solve for x : Show **all** working steps.

$$(1) \quad (2x+1)^2 - 4 = 0 \quad (3)$$

$$(2) \quad -x + 5 - 2x^2 = 0 \quad (\text{rounded to 1 decimal digit}) \quad (3)$$

$$(3) \quad x = \sqrt{2x-1} + 2 \quad (4)$$

$$(4) \quad (x+2)(2x-3) \leq -3 \quad (4)$$

$$(5) \quad -4x^2 - 12x + 8 = 0 \quad (\text{by completion of the square-leave answer in surd form}) \quad (5)$$

$$(6) \quad 3^{2x+2} + 1 = 10.3^x \quad (5)$$

(b) (1) Solve for x and y simultaneously:

$$x + y = 2 \quad \text{and} \quad y + 1 = \frac{-3}{x-1} \quad (6)$$

$$(2) \quad \text{Hence, or otherwise, determine the value(s) of: } \left(\frac{1}{x} + \frac{1}{y} \right) \quad (4)$$

[34]

QUESTION 2

(a) Without using a calculator, evaluate each of the following:

$$(1) \quad (\sqrt{98} - \sqrt{50})^2 \quad (3)$$

$$(2) \quad \left(5 + \frac{1}{16}\right)^{\frac{3}{4}} - (x-3)^0 \quad (4)$$

(b) Simplify the following expressions:

$$\frac{pq^{-1} - p^{-1}q}{q^{-1} - p^{-1}} \quad (4)$$

[11]

QUESTION 3

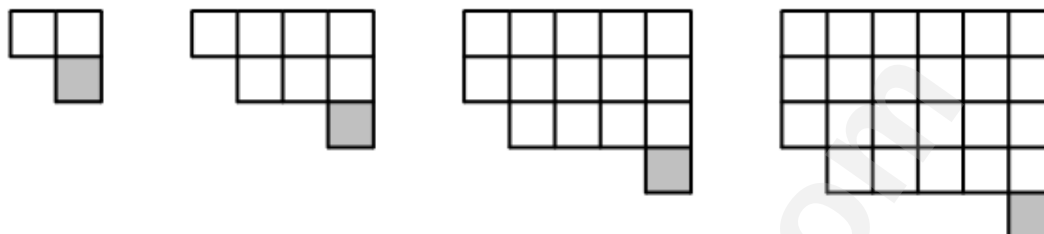
The first term of a linear number pattern is 92 and the constant difference is -4.

- a) Write down the values of the second and third terms. (2)
- b) Determine an expression for the n th term of the number pattern, (2)
- c) Find the value of the eighteenth term. (2)
- d) If $T_p + T_q = 0$, determine the value of $(p + q)$. (4)

[10]

QUESTION 4

Consider the following picture pattern which continues in the same way indefinitely.



Calculate the number of square blocks in the 50th pattern.

[4]

QUESTION 5

Given: the graph of $f(x) = \frac{5}{x}$

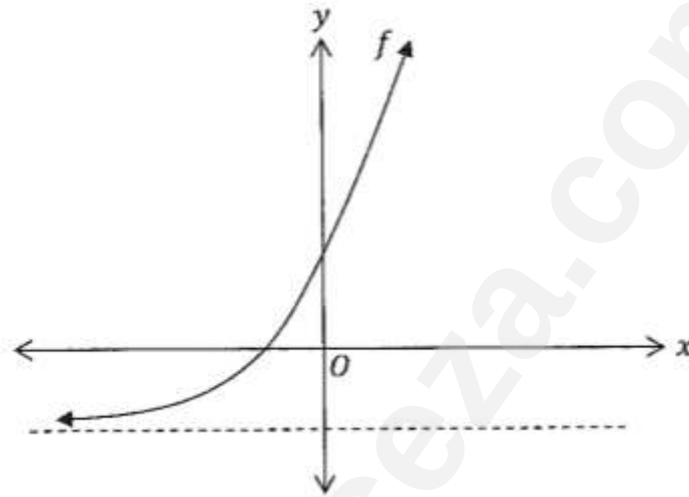
Determine the equation of the new graph formed if the graph of $f(x) = \frac{5}{x}$ is:

- (a) shifted 4 units upward. (1)
- (b) shifted 2 units to the left and then 3 units down. (2)
- (c) reflected about the y-axis. (1)

[4]

QUESTION 6

The sketch below shows the graph of $f(x) = 2a^x - 1$. The point $A(1 ; 5)$ is found on the graph.

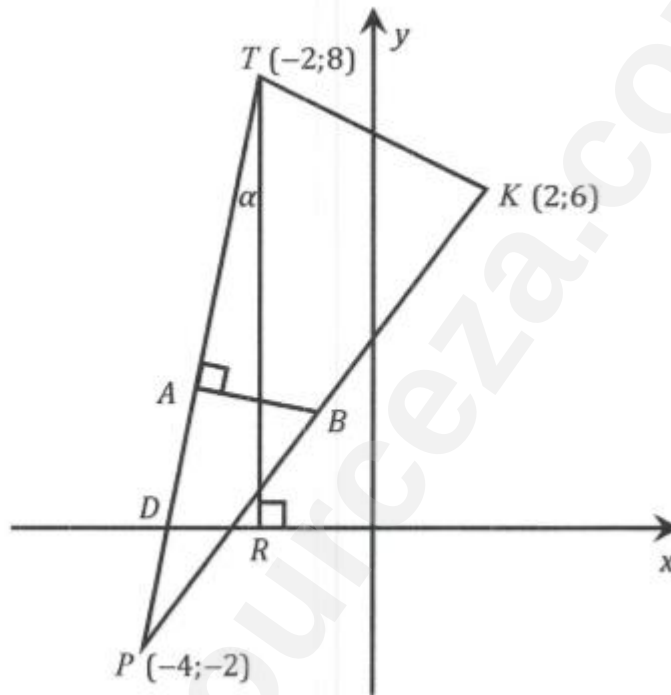


- Show that $a = 3$. (2)
- Determine the y-intercept of f . (2)
- Write down the range of f . (1)
- What will be the equation of $g(x)$ if f is reflected about the x-axis followed by a translation of two units to the left. (2)

[7]

QUESTION 7

Given: $T(-2; 8)$; $K(2; 6)$ and $P(-4; -2)$ are the vertices of $\triangle TKP$. $AB \perp TP$ and $TR \perp y$ -axis. $\angle PTR = \alpha$.



- Determine the co-ordinates of B , the midpoint of PK. (2)
- The equation of TP is $y - 5x = 18$, show that the equation of AB is $y = -\frac{1}{5}x + \frac{9}{5}$. (3)
- Find the value of α , correct to one decimal place. (4)
- Given $N(n; 5)$. Determine the value of n such that T , K and N are collinear. (4)
- If $TKPQ$ is a parallelogram, determine the coordinates of point Q. (4)

[17]

QUESTION 8



A rocket is fired upwards.

It follows a path that fits the equation $h(t) = 120t - 3t^2$, $0 \leq t \leq 40$

where h is the height in metres and t is the time in seconds from launch time.

- (a) Sketch the graph of : $h(t) = 120t - 3t^2$; $0 \leq t \leq 40$ on the grid provided on the **ANSWER SHEET**. Clearly show all turning points and intercepts with axes. (4)

- (b) Use **your graph** to determine:

(1) the time when the height of the rocket is zero. (1)

(2) the flight time of the rocket. (1)

(3) the maximum height of the rocket. (1)

(4) how long after launching does the rocket reach its peak height. (1)

(5) how long is the rocket above 900 m. (4)

- (c) Explain why there is a restriction on t . (1)

[13]

ANSWER SHEET - QUESTION 8 (a)

