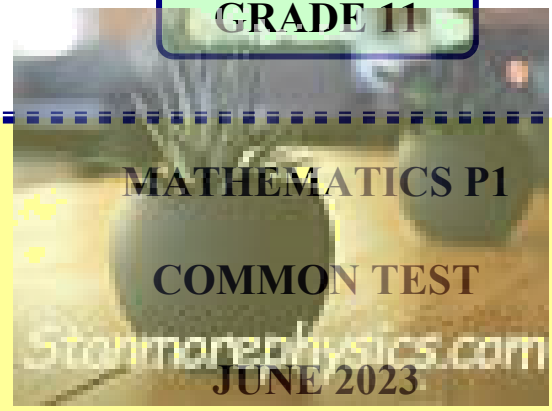
KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11



MATHEMATICS P1

COMMON TEST

JUNE 2023

MARKS: **100**

TIME: **2 hours**

This question paper consists of 6 pages.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 6 questions.
2. Answer ALL the questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. Write neatly and legibly.

QUESTION 1

1.1 Calculate the value of the following WITHOUT using a calculator:

1.1.1 $\dfrac{12^{x-2}.2^{x+2}}{8^{x}.3^{x-4}}$ (4)

1.1.2 $\dfrac{\sqrt{3}\left(\sqrt{3}+\sqrt{6}\right)-\sqrt{50}-3\left(3^{0}\right)}{\sqrt{8}}$ (5)

1.2 Given: $2^{x}+2^{x+2}=-5y+10$

1.2.1 Express 2^{x} in terms of y. Write your answer in simplified form. (3)

1.2.2 Hence, solve for x if $y=\dfrac{15}{8}$. (3)

[15]

QUESTION 2

2.1 Solve for x:

2.1.1 $2x^{2}=7x$ (3)

2.1.2 $2x^{2}-5x-8=0$ (correct to TWO decimal places) (3)

2.1.3 $x^{2}+3x-10<0$ (3)

2.1.4 $x-\sqrt{x+2}=4$ (5)

2.2 Solve for x and y simultaneously:

$$2y-x=1$$
$$x^{2}-6y=37$$

(6)

[20]

QUESTION 3

3.1 The roots of a quadratic equation are given by: $x = \frac{-3 \pm \sqrt{-7m+3}}{4}$.

Determine the value(s) of m for which this equation will have:

3.1.1 two equal roots. (2)

3.1.2 non-real roots. (2)

3.2 Consider the equation: $\frac{1}{x+3} - 1 = \frac{2x}{3-x}$

3.2.1 Why is $x \neq 3$ or $x \neq -3$? (1)

3.2.2 Solve the equation. (6)

3.3 Two numbers, m and n (with $m > n$), are chosen so that their sum is three times their positive difference.

3.3.1 Show that $m = 2n$ (3)

3.3.2 Hence, determine the value of $\frac{5mn}{m^2 + n^2}$ (2)

[16]

QUESTION 4

4.1 Consider the functions: $f(x) = \frac{1}{2}x + 2$ and $g(x) = 2^{x+1} - 1$

4.1.1 Write down the equation of the asymptote of g. (1)

4.1.2 Sketch the graphs of f and g on the same system of axes in your ANSWER BOOK. Show clearly the asymptote and the intercepts with the axes. Label all relevant points. (5)

4.1.3 Use your graphs to determine the value(s) of x for which $f(x).g(x) < 0$. (2)

4.2 Draw a sketch graph of $y = ax^2 + bx + c$ where $a > 0$, $b > 0$, $c < 0$ and $ax^2 + bx + c = 0$ has TWO solutions. (4)

[12]

QUESTION 5

Consider the function: $f(x)=\frac{-2}{x-3}+1$

5.1 Calculate the coordinates of the y-intercept of f. (2)

5.2 Calculate the coordinates of the x-intercept of f. (3)

5.3 Sketch the graph of f in your ANSWER BOOK, showing clearly the asymptotes and the intercepts with the axes. (4)

5.4 For which values of x is $f(x)\leq 0$? (2)

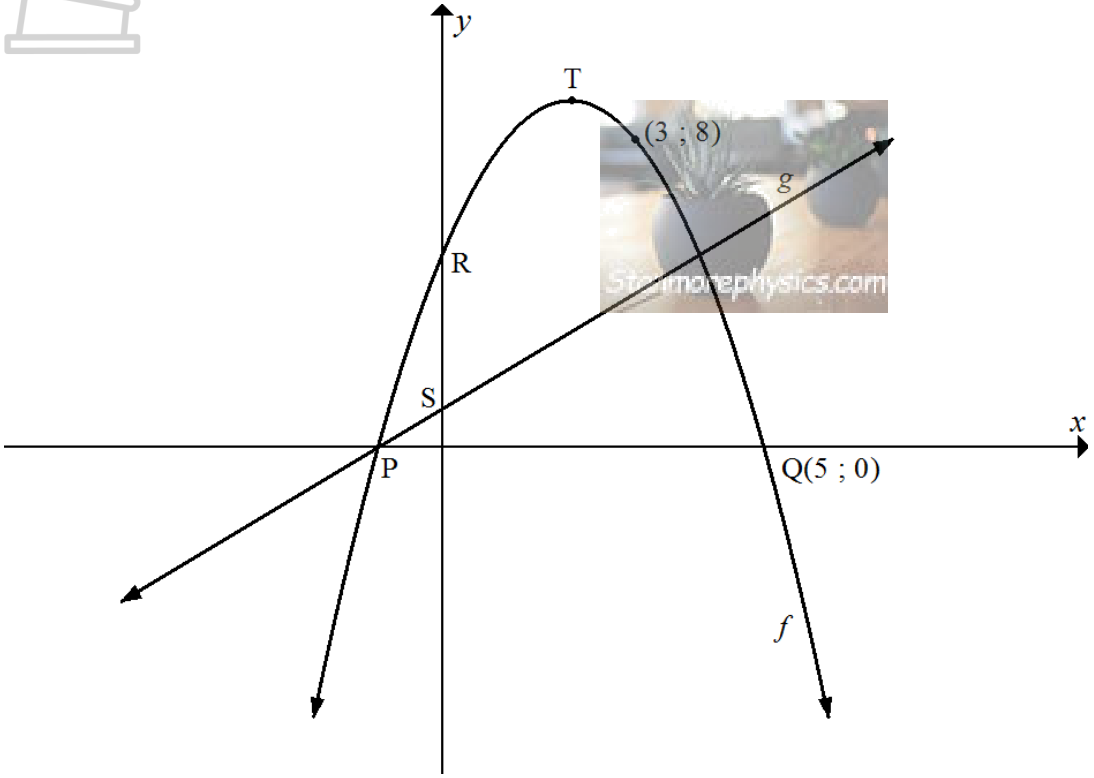
5.5 Calculate the average gradient of f between $x=-2$ and $x=1$. (4)

5.6 Graph h is obtained by translating f by 2 units to the left and 3 units down. Determine the equation of the axis of symmetry of h that has a positive gradient. (4)

[19]

QUESTION 6

The sketch below shows the graphs of $f(x) = ax^2 + bx + c$ and $g(x) = x + 1$. Graph f intersects the x-axis at P and Q(5 ; 0) and the y-axis at R. The point (3 ; 8) lies on f and T is the turning point of f. Graph g intersects the x-axis at P and the y-axis at S.



6.1 Calculate the coordinates of P. (2)

6.2 Show that $a = -1$, $b = 4$ and $c = 5$. (3)

6.3 Calculate the length of RS. (2)

6.4 Calculate the coordinates of T, the turning point of f. (3)

6.5 Determine the value of k for which the line $y = x + k$ will be a tangent to f. (4)

6.6 Determine the values of n for which the equation $-x^2 + 4x + 5 = x + n$ will always have two positive different roots. (2)

6.7 Determine the value of d so that the distance between the roots of the equation $-x^2 + 4x + 5 = d$ is 4. (2)

[18]

TOTAL MARKS: [100]