basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

MATHEMATICS P1

NOVEMBER 2016

MARKS: 150

TIME: 3 hours

This question paper consists of 9 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1.   This question paper consists of 10 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 et cetera that 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 to TWO decimal places, unless stated otherwise.

8.   Diagrams are NOT necessarily drawn to scale.

9.   Write neatly and legibly.

WESTERN CAPE

QUESTION 1

1.1   Solve for x in each of the following:

    1.1.1 $3x^2 - 5x - 1 = 0$ (leave your answer correct to TWO decimal places)   (3)

    1.1.2 $x^2 - 6x + 8 = 0$ (3)

    1.1.3 $4x - 2x^2 < 0$ (4)

    1.1.4 $2^{3x+1} + 2^{3x} = 12$ (4)

    1.1.5 $\sqrt{x-1} + 3 = x - 4$ (6)

1.2   Solve for x and y simultaneously:

    $3x - y + 2 = 0$ and $y = -x^2 + 2x + 8$ (6)

1.3   Show that the roots of $3x^2 + (k + 2)x = 1 - k$ are real and rational for all values of k.   (4)

[30]

QUESTION 2

2.1   Simplify fully, WITHOUT using a calculator:

    2.1.1 $\dfrac{5^{a-2} \cdot 2^{a+2}}{10^a - 10^{a-1} \cdot 2}$ (5)

    2.1.2 $\dfrac{\sqrt{27m^6} - \sqrt{48m^6}}{\sqrt{12m^6}}$ (3)

2.2   WITHOUT using a calculator, show that $\dfrac{2}{1 + \sqrt{2}} - \dfrac{8}{\sqrt{8}} = -2$ (4)

[12]

QUESTION 3

Consider the quadratic pattern: $-9; -6; 1; 12; x; \ldots$

3.1   Determine the value of x.   (1)

3.2   Determine a formula for the nth term of the pattern.   (4)

3.3   A new pattern, P_n, is formed by adding 3 to each term in the given quadratic
            pattern. Write down the general term of P_n in the form $P_n = an^2 + bn + c.$ (1)

3.4   Which term of the sequence found in QUESTION 3.3 has a value of 400?   (4)

                                                                                                 [10]

QUESTION 4

4.1   Given the linear pattern: $18; 14; 10; \ldots$

            4.1.1   Write down the fourth term.   (1)

            4.1.2   Determine a formula for the general term of the pattern.   (2)

            4.1.3   Which term of the pattern will have a value of -70?   (2)

            4.1.4   If this linear pattern forms the first differences of a quadratic pattern,
                          Q_n, determine the first difference between Q_{509} and Q_{510}. (2)

4.2   A quadratic pattern has a constant second difference of 2 and $T_5 = T_{17} = 29$.

            4.2.1   Does this pattern have a minimum or maximum value? Justify the
                          answer.   (3)

            4.2.2   Determine an expression for the nth term in the form
                          $T_n = an^2 + bn + c.$ (5)

                                                                                                 [15]

QUESTION 5

Given: $f(x) = -2x^2 + x + 6$

5.1   Calculate the coordinates of the turning point of f.   (4)

5.2   Determine the y-intercept of f.   (1)

5.3   Determine the x-intercepts of f.   (4)

5.4   Sketch the graph of f showing clearly all intercepts with the axes and turning point.   (3)

5.5   Determine the values of k such that $f(x) = k$ has equal roots.   (2)

5.6   If the graph of f is shifted two units to the right and one unit upwards to form h,
       determine the equation h in the form $y = a(x + p)^2 + q$.   (3)
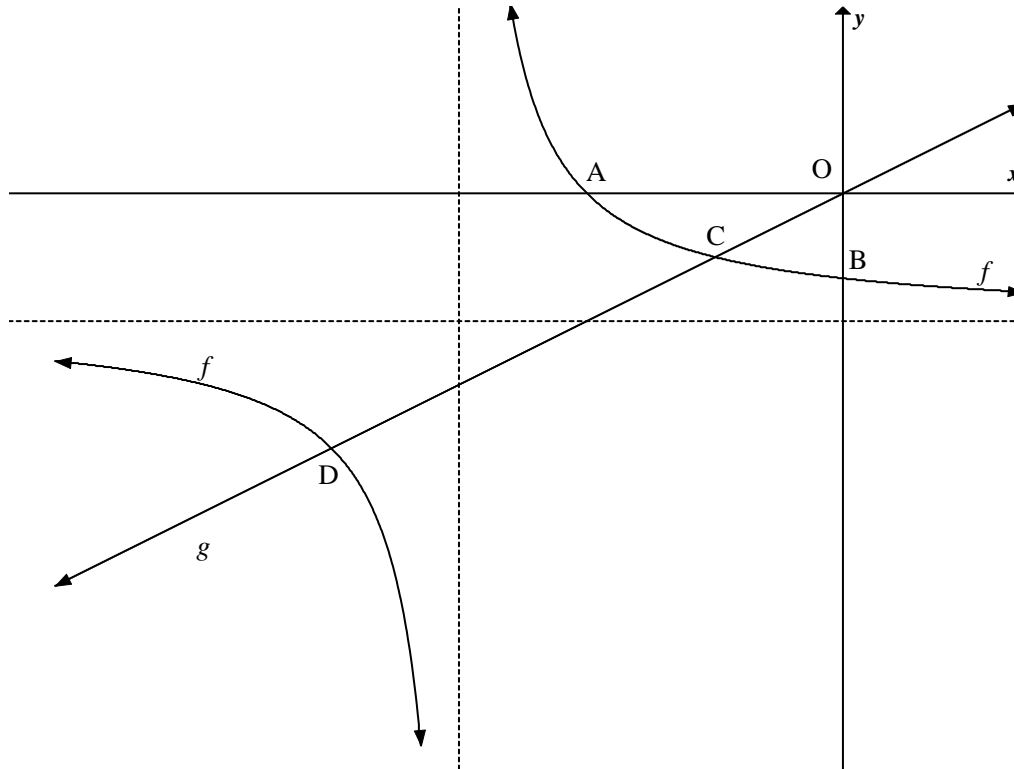
[17]

QUESTION 6

The diagram below shows the graph of $f(x) = \dfrac{1}{x+3} - 1$ and $g(x) = \dfrac{1}{2}x$.

The graph of f intersects the x-axis at A and the y-axis at B.
The graph of f and g intersect at points C and D.

6.1   Write down the equations of the asymptotes of f.   (2)

6.2   Determine the domain of f.   (2)

6.3   Calculate the length of:

         6.3.1   OB   (2)

         6.3.2   OA   (3)

6.4   Determine the coordinates of C and D.   (6)

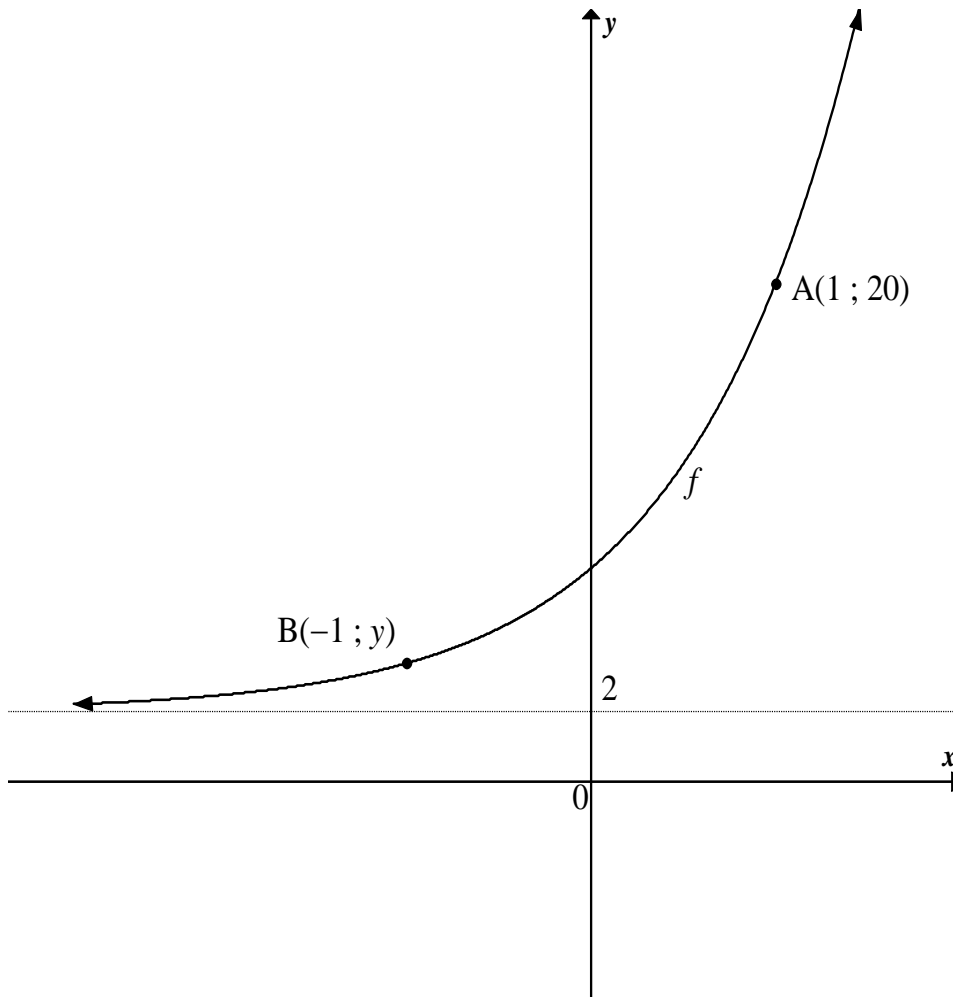6.5   Use the graphs to obtain the solution to: $\dfrac{1}{x+3} \geq \dfrac{x+2}{2}$ (4)

                                                                                                [19]

QUESTION 7

The sketch below is the graph of $f(x) = 2.b^{x+1} + q$.
The graph of f passes through the points A(1 ; 20) and B (–1 ; y).
The line $y = 2$ is an asymptote of f.

7.1   Show that the equation of f is $f(x) = 2(3)^{x+1} + 2$ (3)

7.2   Calculate the y-coordinate of the point B.   (1)

7.3   Determine the average gradient of the curve between the points A and B.   (2)

7.4   A new function h is obtained when f is reflected about its asymptote.
        Determine the equation of h.   (2)

7.5   Write down the range of h.   (1)
   **[9]**

QUESTION 8

8.1 A machine costs R25 000 in 2016. Calculate the book value of the machine after 4 years if it depreciates at 9% p.a. according to the reducing balance method. (3)

8.2 The nominal interest rate of an investment is 12,35% p.a., compounded monthly. Calculate the effective interest rate. (4)

8.3 The value of a property increased from R145 000 to R221 292,32 over 6 years. Calculate the average annual rate of increase of the property over 6 years. (4)

8.4 Tebogo made an initial deposit of R15 000 into an account that paid interest at 9,6% p.a., compounded quarterly. Six months later she withdrew R5 000 from the account. Two years after the initial deposit she deposited another R3 500 into this account. How much does she have in the account 3 years after her initial deposit? (5)

[16]

QUESTION 9

9.1 Given: $P(A) = 0,2$
                    $P(B) = 0,5$
                    $P (A \text{ or } B) = 0, 6$ where A and B are two different events

    9.1.1   Calculate P(A and B). (2)

    9.1.2   Are the events A and B independent ? Show your calculations. (3)

9.2 A survey was conducted amongst 100 learners at a school to establish their involvement in three codes of sport, soccer, netball and volleyball. The results are shown below.

- 55 learners play soccer (S)
- 21 learners play netball (N)
- 7 learners play volleyball (V)
- 3 learners play netball only
- 2 learners play soccer and volleyball
- 1 learner plays all 3 sports

The Venn diagram below shows the information above.
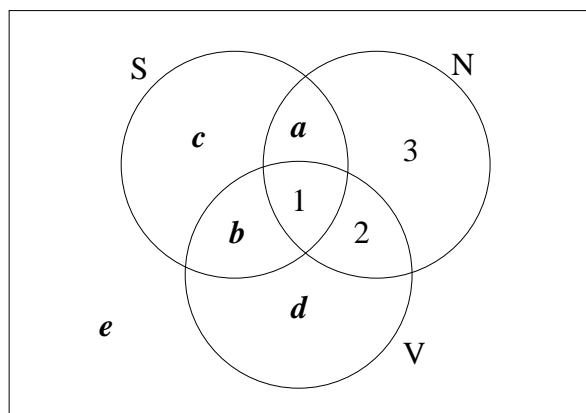
    9.2.1   Determine the values of a, b, c, d and e. (5)

    9.2.2   What is the probability that one of the learners chosen at random from this group plays netball or volleyball? (2)

9.3   The probability that the first answer in a maths quiz competition will be correct is 0,4. If the first answer is correct, the probability of getting the next answer correct rises to 0,5. However, if the first answer is wrong, the probability of getting the next answer correct is only 0,3.

    9.3.1   Represent the information on a tree diagram. Show the probabilities associated with each branch as well as the possible outcomes. (3)

    9.3.2   Calculate the probability of getting the second answer correct. (3)

                                                                        [18]

QUESTION 10

Bongani wants to start a small vegetable garden at his house. He wants to use an existing wall and 14 m of fencing to enclose a rectangular area for the garden. Calculate the dimensions of the largest rectangular area that he can enclose. **[4]**

                                                        TOTAL: 150