LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL
SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P1

SEPTEMBER 2018

MARKS: 150

TIME: 3 hours

This question paper consists of 11 pages including information sheet.

QUESTION 1

1.1 Solve for x:

1.1.1 $(x-3)(x+1)=0$ (2)

1.1.2 $x^2 - x = 4$ (correct to two decimal places) (4)

1.1.3 $x + \sqrt{x-2} = 4$ (5)

1.1.4 $x(2x-1) \geq 0$ (3)

1.2 Given: $P = \dfrac{4^{x+3} + 4^x}{8^{x+2} + 8^x}$

1.2.1 Simplify P fully. (4)

1.2.2 Hence solve for x if $P = 8$. (2)

1.3 Given: $3y = -3 + x + x^2$ and $\displaystyle\sum_{k=3}^{4} x(k-2)^2 = 5y$

Determine x and y. (5)

[25]

QUESTION 2

The first four terms of a quadratic sequence are: $10-3y$; 7 ; 15 ; $8y+1$..

2.1 Calculate y. (4)

2.2 If $y = 3$, determine T_n (4)

2.3 Determine the first term in this quadratic sequence that is greater than 2157

(3)

[11]

QUESTION 3

3.1　The first two terms of an arithmetic series are p and q.
Express the following in terms of: p and q.　Leave answers as a simplified expression.

　　3.1.1　The tenth term　　　　　　　　　　　　　　　　　　　(2)

　　3.1.2　The sum of the first twenty terms.　　　　　　　　　(2)

3.2　In an arithmetic sequence, $T_3 + T_4 = 167$ and $T_{21} = -4$

　　3.2.1　Show that the value of the constant difference is -5.　(4)

　　3.2.2　Calculate the sum of the first 21 terms.　　　　　　(3)

3.3　The first term of a geometric sequence is -3, and the common ratio is $-\dfrac{1}{3}$.
Determine the sum to infinity of all the negative terms.　　　(5)

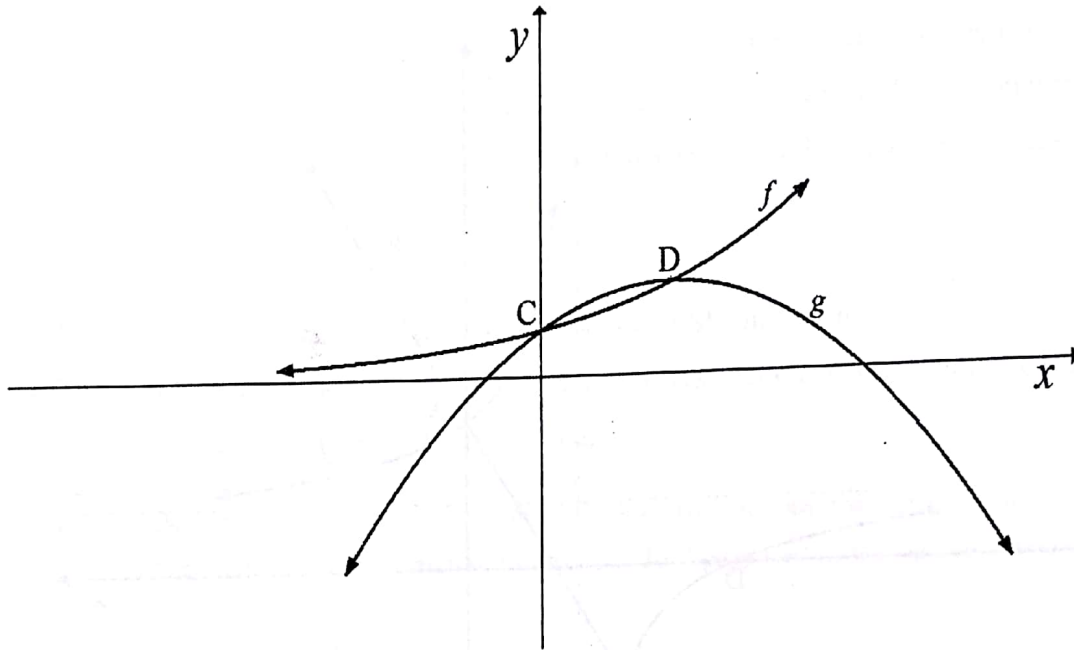　　　　　　　　　　　　　　　　　　　　　　　　　　　　**[16]**

QUESTION 4

Sketched below are graphs of $f(x) = 2^x$ and $g(x) = -(x-1)^2 + q$, where q is a constant.
The graphs of f and g intersect at C and D.
C is the y-intercept of both f and g
D is the turning point of g.

4.1   Show that $q = 2$.   (2)

4.2   Write down the coordinates of the turning point of g.   (2)

4.3   Determine the value(s) of t for $g(x) = t$ if the roots are equal.   (1)

4.4   Write down the equation of $f^{-1}(x)$ in the form $y = ...$ (2)

4.5   Sketch the graph of f^{-1} on a system of axes. Indicate the x – intercept and the
      coordinates of one other point on your graph.   (3)

4.6   Write down the equation of h if $h(x) = g(x+1) - 2$ (2)

4.7   How can the domain of h be restricted so that h^{-1} will be a function?   (1)
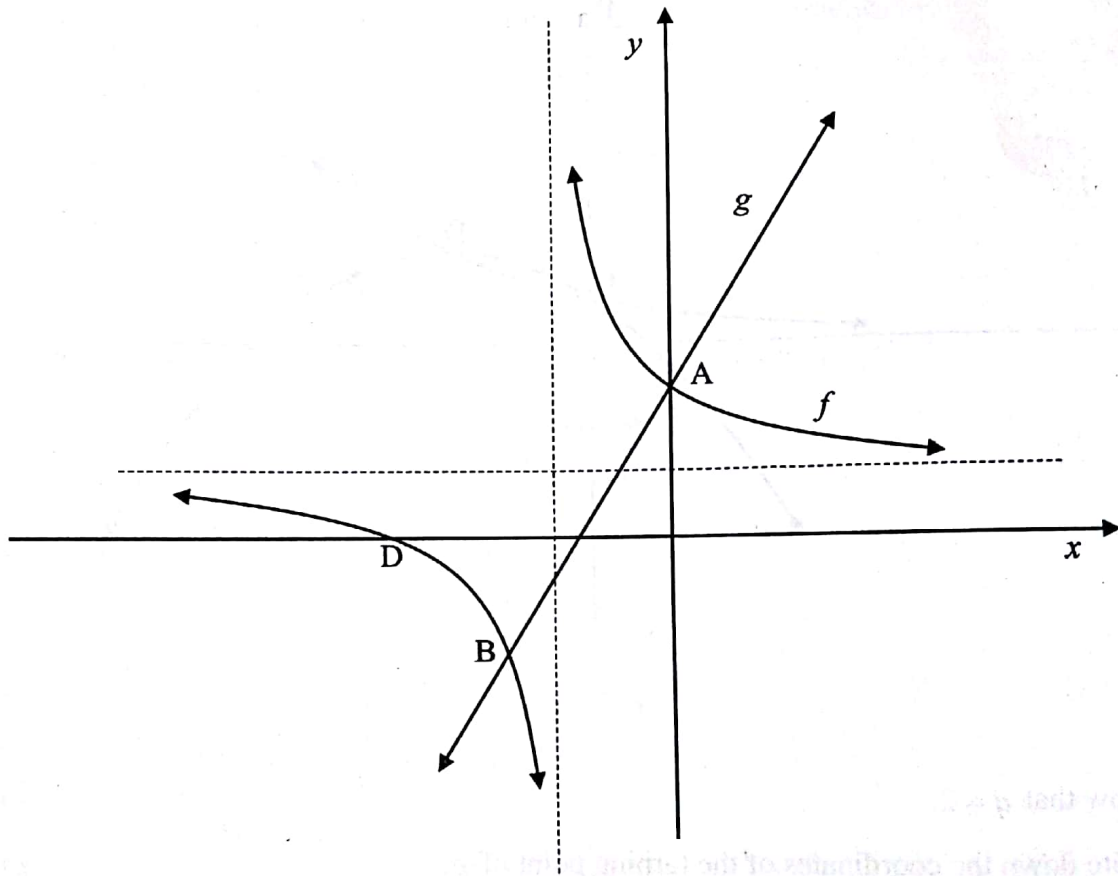
                                                                                         [13]

QUESTION 5

Sketched below are the graphs of $y = f(x) = \dfrac{4}{x+2} + 1$ and $g(x) = 2x + 3$.

A, the y – intercept of both f and g, and B are the points of intersection of f and g.

D is the x – intercept of f.

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

5.2   Determine the coordinates of :

    5.2.1   A   (1)

    5.2.2   D   (3)

    5.2.3   B   (4)

5.3   Calculate the average gradient of f between A and D.   (2)

5.4   For which value(s) of x is $f(x).g'(x) \leq 0$ (3)

                                                                                            [15]

QUESTION 6

6.1   Abel bought a motorbike for R12 500. It depreciated in value to R5 546,32
       after 5 years. Calculate the annual depreciation rate.   (3)

6.2   Shaun purchased an Internet Café for R1 800 000. He paid a deposit of 60% and
       financed the balance through a banking institution. The bank offered him the loan
       which had to be repaid at the end of each month at an interest rate of 8% per annum
       compounded monthly. The first payment was made two months after the loan was
       received.

       6.2.1   Calculate the effective annual interest rate of Shaun's loan.   (4)

       6.2.2   Show that the monthly instalment to the nearest Rand is R8 842,16 if the loan
                is repaid 10 years after it was granted.   (5)

       6.2.3   Based on the monthly instalment of R8 842,16 calculate the outstanding
                balance of the loan immediately after the 36th payment to the nearest Rand   (5)
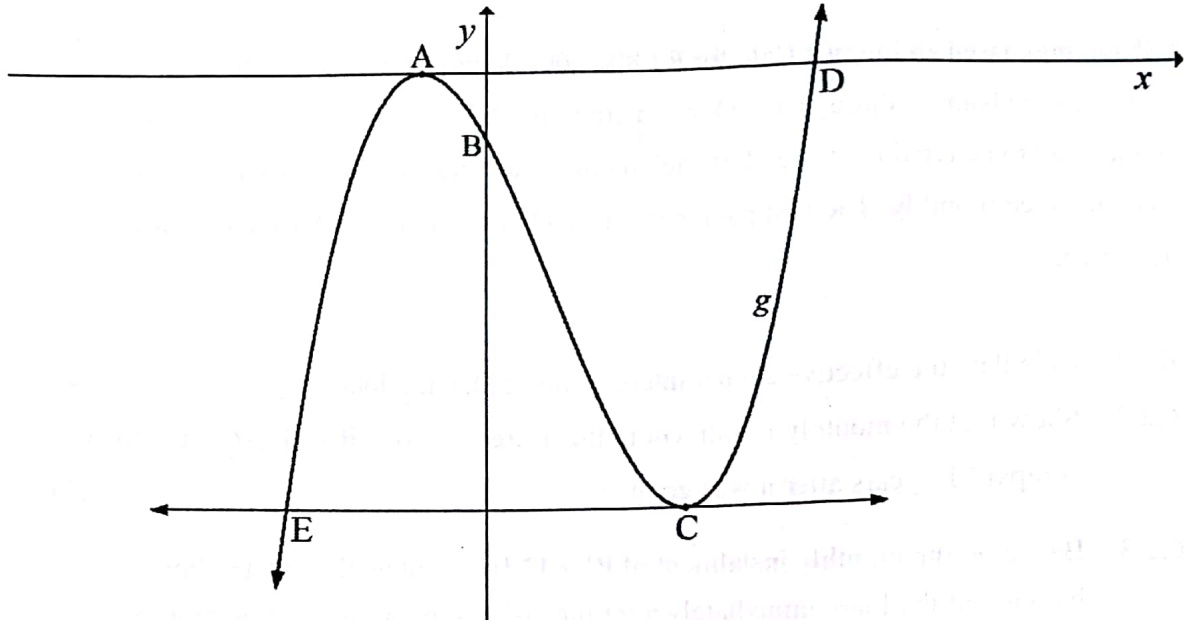
                                                                                       [17]

QUESTION 7

7.1   Given: $f(x) = 3x^2 + 2$, determine $f'(x)$ from first principles.   (5)

7.2   Determine $\dfrac{dy}{dx}$ given $y = -(2x-3)^2$ (3)

7.3   Given: $f(x) = x\sqrt{x} + 2\sqrt{x}$, calculate $f'(4)$ (4)

                                                                                       [12]

QUESTION 8

The sketch represents of cubic function $g(x) = x^3 - 3x^2 - 9x - 5$.

A and C are local maxima and minima. D is an x-intercept of g. B is the y-intercept of g.

E is a point on g such that EC is a tangent to g at C.


8.1 Calculate the co-ordinates of the x – intercepts of g if $(x+1)$ is a factor of $g(x)$ (2)

8.2 Determine the coordinates of A and C the turning points of g (3)

8.3 Determine the x coordinate of E. (3)

8.4 Determine:

    8.4.1 The coordinates of the point of inflection of g. (3)

    8.4.2 The equation of the tangent to g at the point of inflection (4)

[15

QUESTION 9

Jane wants to cut two circles out of a rectangular piece of cardboard of 2 metres long and $4x$ metres wide. The radius of the larger circle is half the width of the cardboard and the smaller circle has a radius that is $\dfrac{2}{3}$ the radius of the bigger circle.
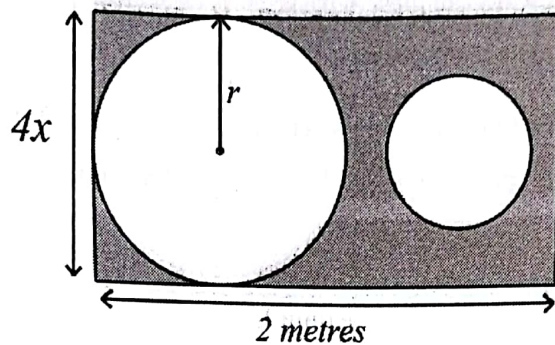
9.1 Show that the area of the shaded region is $A = 8x - \dfrac{52\pi x^2}{9}$ (4)

9.2 Determine the value of x, such that the area of the shaded region is a maximum. (4)

9.3 Calculate the maximum shaded region. (1)

[9]

QUESTION 10

10.1 A box contains 7 cards numbering 1 to 7.

Two cards are drawn at random, one after the other without replacement.

Calculate the probability that the numbers on the cards drawn out of the box, when multiplied result in an odd product. (3)

10.2 For two events A and B, in the sample space S, it is given that

$P(A) = 0,55$, $P(B) = 0,6$ and $P(A \text{ and } B) = 0,25$.

10.2.1 Draw a Venn diagram to represent the information. (3)

10.2.2 Determine:

(a) $P(A \text{ and } B')$ (2)

(b) $P(A \text{ or } B')$ (1)

[9]

QUESTION 11

A EASY FLY Airways aeroplane has 6 seats in each row.

11.1 How many possible unique arrangements are there for 6 people to sit in a row? (2)

11.2 Sammy, Anees and 4 other passengers sit in a certain row on a EASY FLY flight. In how many different ways can these 6 passengers be seated if Sammy and Anees must sit next to each other? (2)

11.3 Cois and 5 other passengers are to be seated in a certain row. If seats are allocated at random, what is the probability that Cois will sit at an end of the row? (4)

[8]

TOTAL : 150