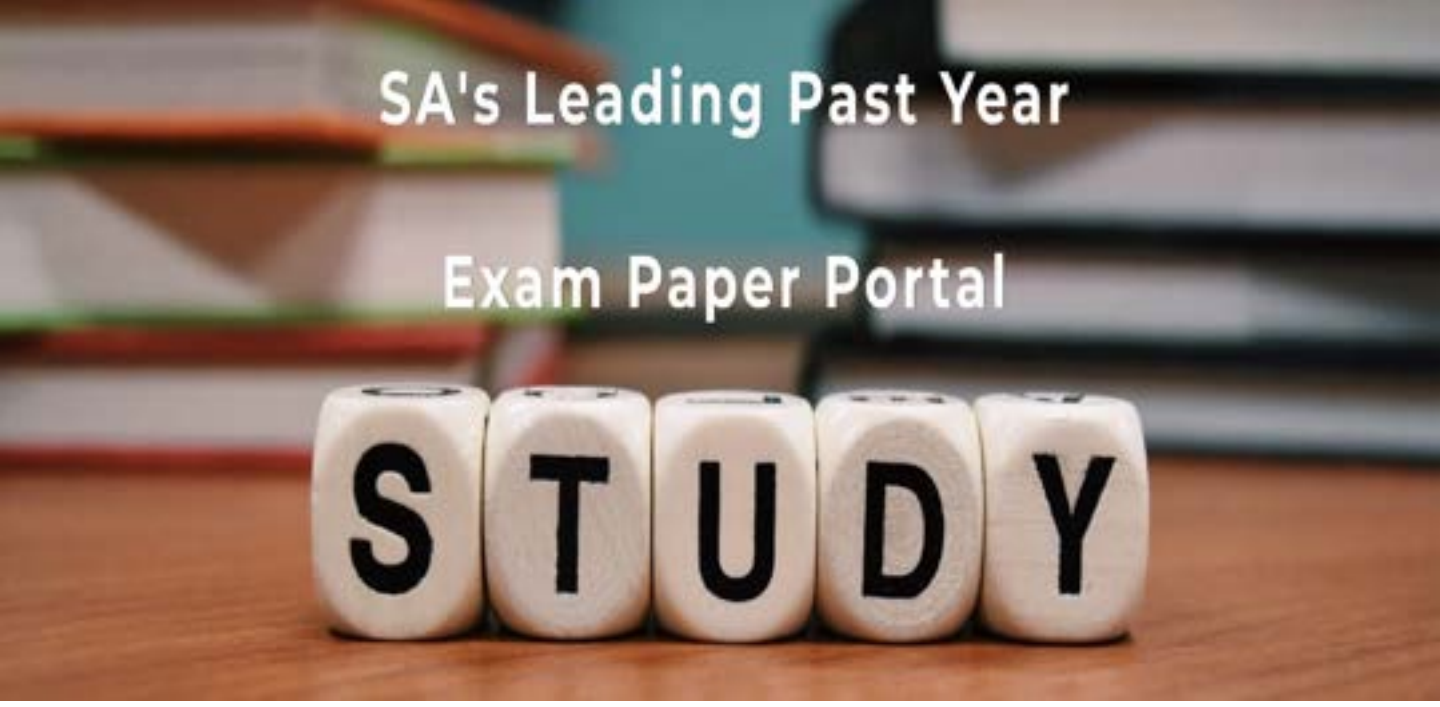

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GRADE 12

MATHEMATICS PAPER 1

SEPTEMBER 2018

MARKS: 150
TIME: 3 hours

This question paper consist of 10 pages and information sheet

QUESTION 1

1.1 Solve for x:

1.1.1 $x^2 + 5x + 6 = 0$ (2)

1.1.2 $x(2x-5)+1 = 0$ (5)

1.1.3 $3x^2 - 8x + 4 > 0$ (3)

1.1.4 $3^x - 3^{x-2} = 24$ (4)

1.2 Solve for x and y in the following simultaneously:

$$y + \frac{1}{2}x = 2$$

$$x^2 + y^2 + 6x = 4y - 4$$ (7)

1.3 Determine for which values of p will the equation $px^2 + (p-2)x + p = 0$ have equal roots. (5)

[26]

QUESTION 2

2.1 ... ; ... ; 1 ; 7 ; 15 ; ... are the third, fourth and fifth terms of a quadratic sequence.

2.1.1 Calculate the first term of the sequence. (2)

2.1.2 Calculate the general term of the sequence.. (4)

2.1.3 Which term in the sequence is 415? (3)

2.2 $x\ ;\ x+3\ ;\ 3x-1$ is a geometric sequence

2.2.1 Calculate the value of x. (4)

2.2.2 Calculate the sum of the first 20 terms of the sequence if $x = -1$. (3)

2.2.3 Give a reason why the series will, or will not, converge, if $x = \frac{9}{2}$. (2)

2.3 The k^{th} term of an arithmetic sequence is m, and the m^{th} term is equal to k, where $m \neq k$.
Find the common difference of the sequence. (5)

2.4 Given: $\sum_{p=1}^{5}(p+q) = 15k$

Determine q in terms of k. (3)

[26]

QUESTION 3

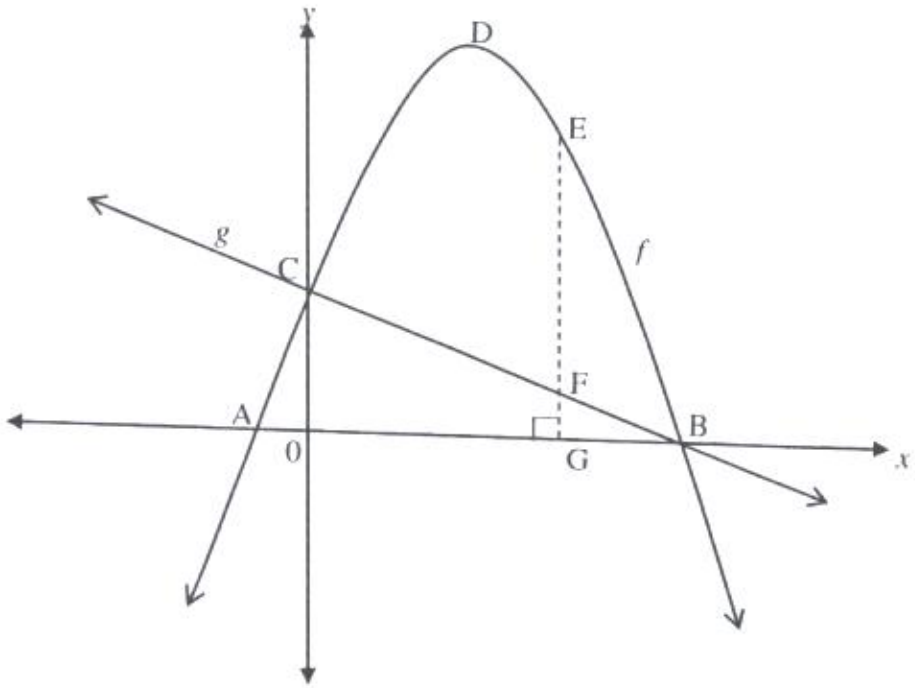
In the diagram below, $f(x) = -x^2 + 2x + 3$ and $g(x) = -x + 3$ are draw.

C is the $y-$ intercept of f and g.

A and B are the $x-$ intercepts of f, and B is the $x-$ intercept of g.

D is the turning point of f.

EFG is a straight line parallel to the $y-$ axis with E on f and F on g.



3.1 Determine the coordinates of D, the turning point of f. (4)

3.2 Calculate the length of AB. (3)

3.3 Calculate the value of x for which EF has a maximum length. (4)

3.4 Determine the range of p if $p(x) = f(x) - 2$ (2)

3.5 If $h(x) = x^2$,

3.5.1 Describe the transformation from f to h. (3)

3.5.2 Restrict the domain of h for h^{-1} to be a function. (2)

3.6 Determine the values of x for which:

3.6.1 $f(x) - g(x) > 0$ (2)

3.6.2 $f'(x) < 0$ (2)

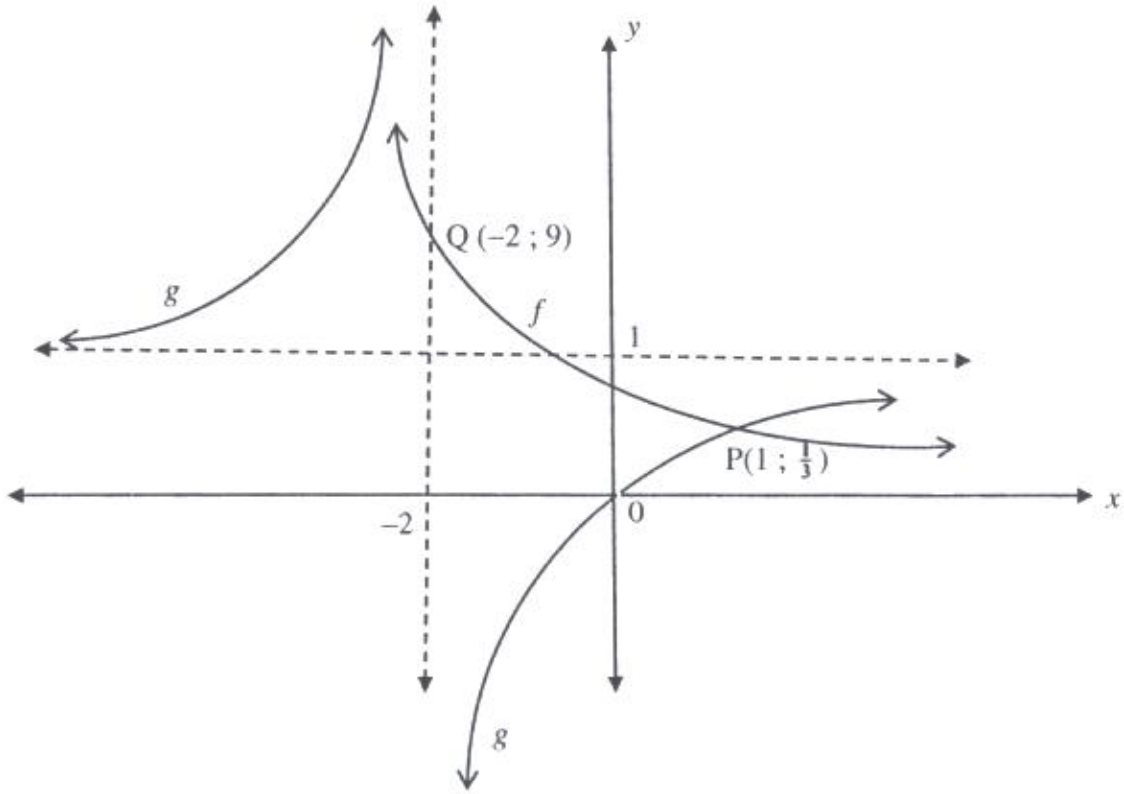
[21]

QUESTION 4

In the diagram below, the graphs of $f(x) = a^x$ and $g(x) = \frac{k}{x+p} + q$ are drawn.

$P\left(1 ; \frac{1}{3}\right)$ is the point of intersection of f and g.

$Q(-2;9)$ is the point of intersection of f and the vertical asymptote of g.



4.1 Determine:

4.1.1 the value a. (2)

4.1.2 the equation of g. (4)

4.2 Write down the equation of $f^{-1}(x)$, in the form $f^{-1}(x) = ...$ (1)

4.3 If $h(x) = x + c$ is the axis of symmetry of g, determine the value of c. (2)

4.4 Use the graph to find the solution of $\log_a x > 0$. (2)

[11]

QUESTION 5

5.1 How many years will it take for an article to depreciate to half its' value according to the reducing balance method at 7,5% per annum?
Give your answer to the nearest month. (5)

5.2 Kevin is planning to buy his first home. The bank will allow him to use a maximum of 30% of his monthly salary to repay his bond.

5.2.1 If Kevin earns R18 480 per month, calculate the maximum amount that the bank will allow Kevin to spend per month on his bond repayments. (1)

5.2.2 Suppose, at the end of each month, Kevin repays the maximum amount allowed by the bank. How much does Kevin borrow if he takes 25 years to repay the loan at a rate of 8% p.a., compounded monthly. The first repayment is made one month after the loan is granted. (4)

5.3 Maria opens a savings account with a single deposit of R1 000 on 1 April 2015. Then she makes 18 monthly deposits of R700 at the end of every month. Her first payment is made on 30 April 2015 and her last payment on 30 September 2016. The account earns 15% per annum compounded monthly.
Determine the amount that should be in her savings account immediately after her last payment is made. (That is 30 September 2016) (5)

[15]

QUESTION 6

6.1 Given: $f(x) = -2x^2 + 5$
Determine $f'(x)$ from FIRST PRINCIPLES. (5)

6.2 Determine $\frac{dy}{dx}$, if $y = 5x + \frac{6}{\sqrt{x}}$ (4)

6.3 Given: $g(x) = \frac{2x^3 + x^2 - 3x}{x - 1}$
Calculate $g'(2)$ if $x \neq 1$. (4)

[13]

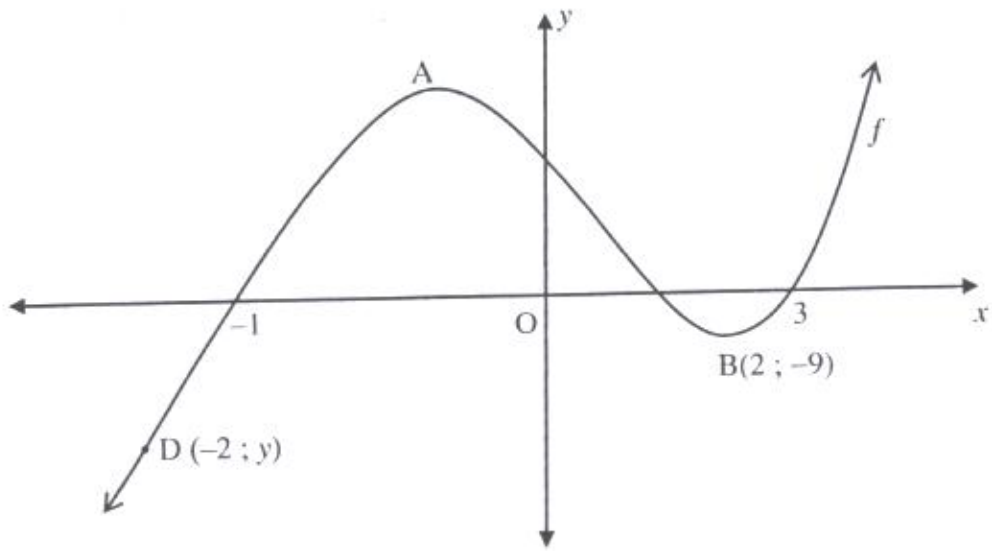
QUESTION 7

In the diagram below, the graph of $f(x) = 2x^3 + bx^2 + cx + d$ is drawn.

The $x-$ intercepts of f are -1, $\frac{1}{2}$, and 3.

A and B(2 ; –9) are turning points of f.

D (–2 ; y) is a point on f.



7.1 Find the equation of f. (4)

7.2 Calculate the coordinates of A if it is given that $f(x) = 2x^3 - 5x^2 - 4x + 3$ (6)

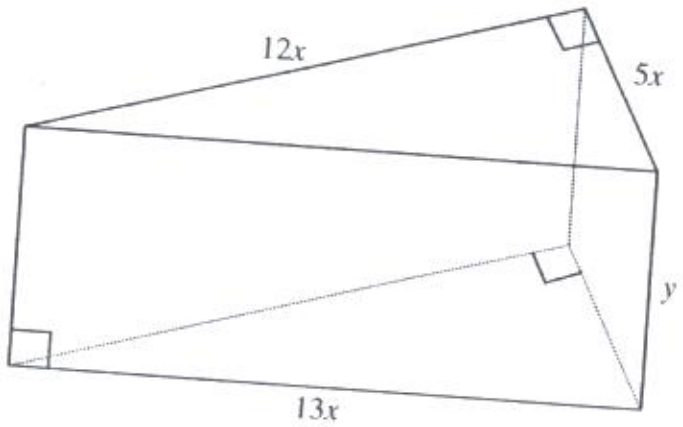
7.3 Determine the equation of the tangent to f, through the point D, in the form $y = mx + c$. (4)

7.4 For which value(s) of x will f be concave up? (2)

[16]

QUESTION 8

A wooden block is made as shown in the diagram below. The ends are right angled triangles having sides $5x$, $12x$ and $13x$. The length of the block is y. The total surface area of the block is $600cm^2$.



8.1 Show that :

$$y = \frac{20-2x^2}{x}$$

(3)

8.2 Determine the value of x for which the block would have the maximum volume. (4)

[7]

QUESTION 9

9.1 A six sided dice is rolled and the number of dots landing face up is noted.

Consider the following events:

Event A: the number observed is 2 at the most

Event B: the number landed face up is an even number

Event C: the number 6 is facing up

9.1.1 Calculate P(A or B) (4)

9.1.2 Which events are mutually exclusive? Give a reason for your answer. (2)

9.1.3 Are B and C independent events? Give a reason for your answer. (3)

9.2 A British tourist plans on visiting South-Africa. He intends to visit the following attractions: the Kruger National Park in Mpumalanga, the State Theatre in Gauteng, Table Mountain in Western Cape, the Big Hole in Northern Cape, Ushaka Marine World in Kwa-Zulu Natal and Sun City in North West.

9.2.1 How many different travelling plans can be made if:

9.2.1.1 there are no restrictions (2)

9.2.1.2 he has to visit the State Theatre first and Table Mountain last (2)

9.2.2 What is the probability if he has to visit the attractions in the Cape Province together ? (2)

[15]

TOTAL: 150