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TOTAL MARKS

Sequence number

NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2026

MATHEMATICS: PAPER I

EXAMINATION NUMBER

Time: 3 hours

150 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 32 pages and an Information Sheet of 2 pages (i–ii). Please check that your question paper is complete.
2. Read the questions carefully.
3. **Answer all of the questions on the question paper and hand this in at the end of the examination. Remember to write your examination number in the space provided.**
4. Write your answers in the spaces provided.
5. You may use an approved non-programmable and non-graphical calculator unless otherwise stated.
6. Clearly show **ALL** calculations, diagrams, graphs, etc. that you have used to determine your answers. **Answers only will NOT necessarily be awarded full marks.**
7. Diagrams are not necessarily drawn to scale.
8. If necessary, round off answers to **TWO** decimal places unless otherwise stated.
9. It is in your own interest to write legibly and to present your work neatly.
10. Three blank pages (pages 30–32) are included at the end of the question paper. Use these pages if you run out of space for a question. Clearly indicate the number of the question that you are answering should you use this additional space.

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Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	TOTAL
14	10	9	11	8	7	14	14	14	7	8	11	9	14	/150

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SECTION A

QUESTION 1

(a) Solve for x.

(1) $2x(2x+4)(x-1)=0$

(3)

(2) Solve for x by completing the square.

$x^2-5x+2=0$

Leave your answer in surd form.

(4)

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(3) Solve for x: $2x^2 - 3x + 1 \leq 0$ if $x \in \mathbb{N}$.

(4)

(b) Discuss the nature of the roots of $x^2 - 2px + 2p^2 = 0$ for all of the real values of p, where $p \neq 0$.

(3)
[14]

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QUESTION 2

(a) Solve for x if $3^{3x-1} - 27 = 0$. (3)

(b) Solve for x if $\log(x-4) + \log(x-3) = \log x^2$. (4)

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(c) If $x+2$ is a factor of x^3+px+6, calculate the value of p.

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(3)
[10]

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QUESTION 3

Given: $f(x) = 2x^2$.

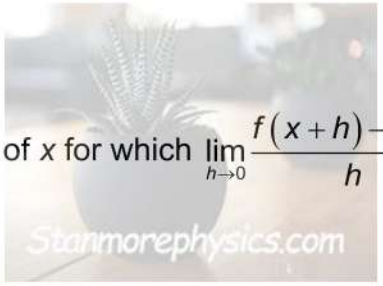
(a) Determine the average rate of change of f over the interval $[x\,;\,x+h]$.

Simplify your answer.



(4)

(b) Hence, determine the value of x for which $\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h} = -3$.



(2)

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(c) Find $f'(x)$ if $f(x)=(3-2x)^2$.





(3)
[9]

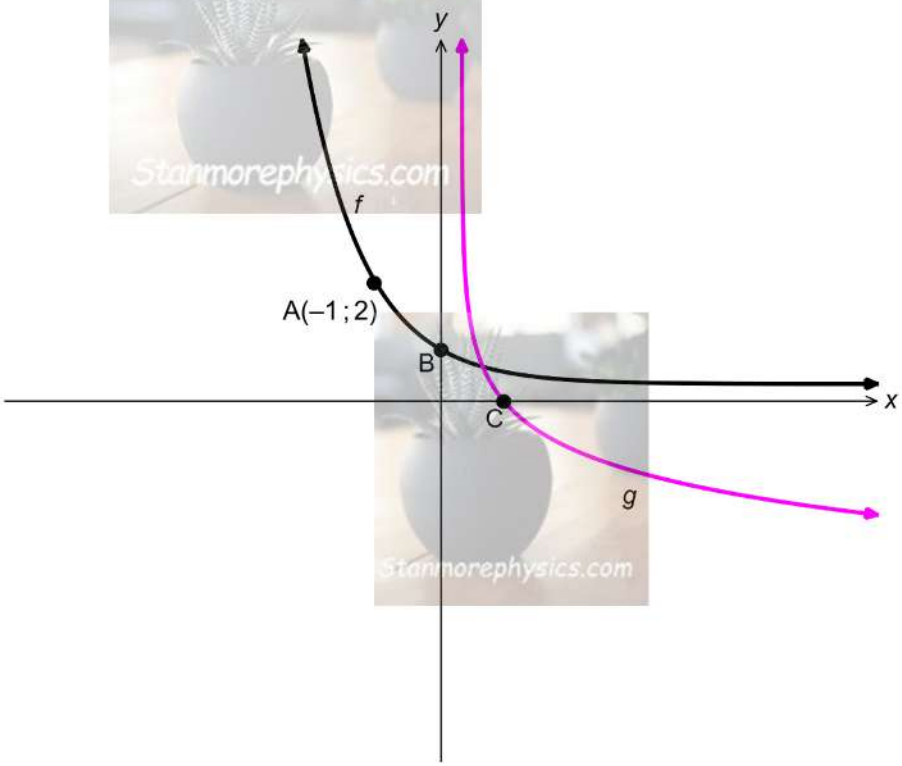
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QUESTION 4

(a) In the diagram below:

- A(–1 ; 2) lies on the graph of $f(x) = a^x$;
- the graphs of f and g are sketched; and
- f and g are symmetrical about the line $y = x$.



(1) Determine the value of a.

(2)

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(2) Determine the equation of *g*.

(2)

(3) Write down the coordinates of C: the *x*-intercept of *g*.

(1)

(4) If *h* is the reflection of *f* in the *y*-axis, write down the equation of *h*.

(1)

(5) A translation is applied to the graph of *f* such that $A(-1;2)$ becomes $(0;0)$.

Find the equation of the new graph.

(2)

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(b) Given: the relation f defined by $(x;f(x))$:

$$f=\left\{(3\,;\frac{5}{4})\,;(0\,;2)\,;(-4\,;0)\,;(3\,;k)\right\}$$

(1) Determine the range of f^{-1}, the inverse of f.

(1)

(2) Determine the value(s) of k for which f is not a function.

Give a reason for your answer.

(2)
[11]

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QUESTION 5

(a) Let:

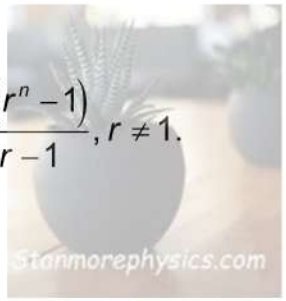
$$S_n = a + ar + ar^2 + \cdots + ar^{n-1}$$

(1) Determine $rS_n - S_n$.

Simplify your answer.

(2)

(2) Hence, show that $S_n = \dfrac{a\left(r^n - 1\right)}{r - 1}, r \neq 1.$



(1)

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(b) Given: $S_n = \frac{a\left(r^n - 1\right)}{r - 1}$.

Determine n in terms of S_n, a, and r. (3)

(c) In a geometric series, $S_n = 605$, the common ratio is 3, and the first term is 5.

Determine the value of n. (2)

[8]

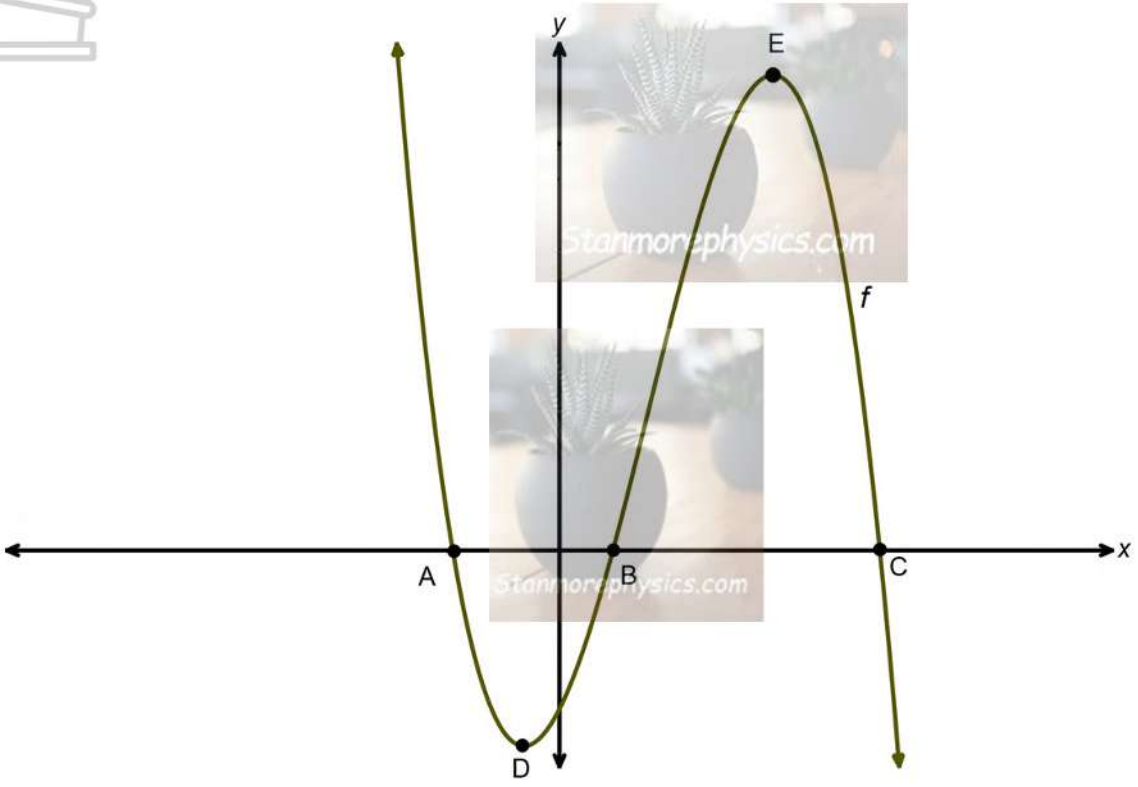
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QUESTION 6

In the diagram below:

- $f(x) = -x^3 + 5x^2 + 8x - 12$;
- D and E are the turning points of f; and
- A, B, and C are the x-intercepts.



(a) Determine the coordinates of E.

(4)

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(b) Determine the interval on which f is concave down.





(3)
[7]

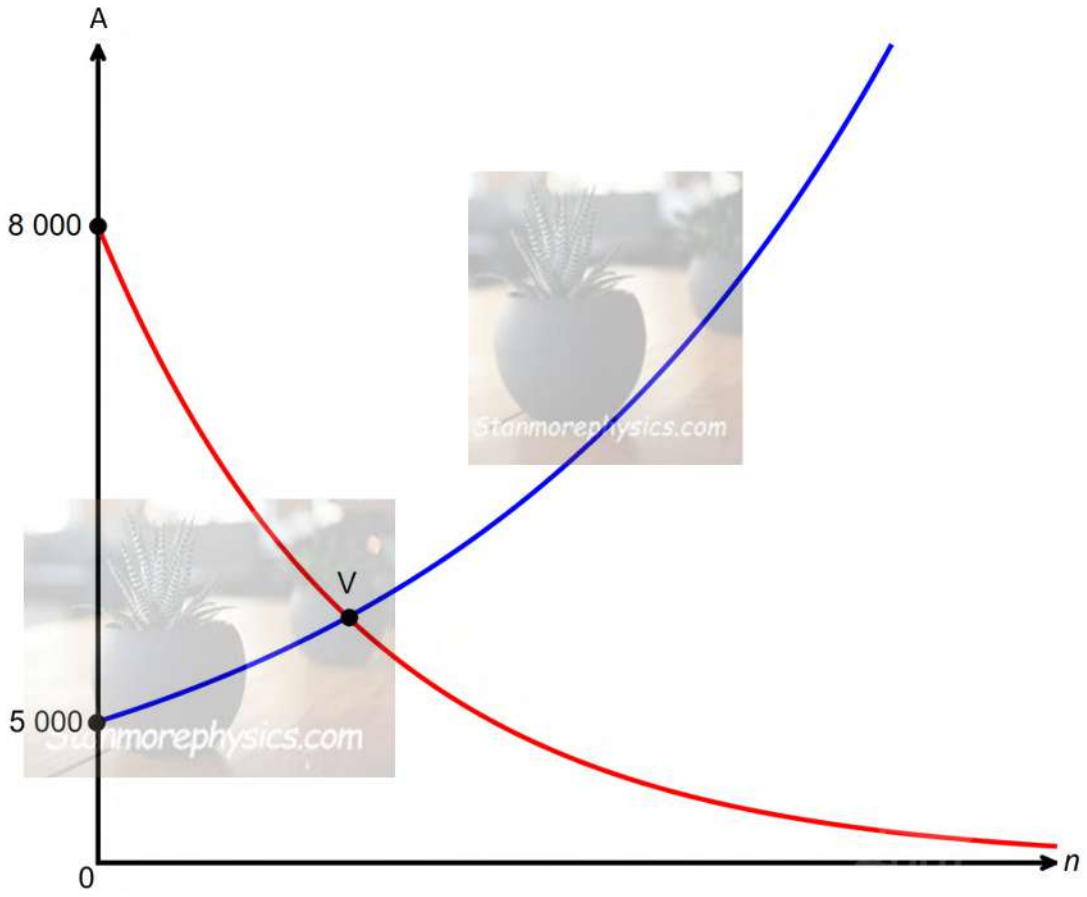
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QUESTION 7

(a) The diagram shows the values of two stocks listed on the Johannesburg Stock Exchange (JSE) over a period of 12 years.

- The horizontal axis represents time in years, n, where $0 \leq n \leq 12$.
- The vertical axis represents the value of the stock, A, in rands.
- At $n = 0$, Tlhogi's stock is worth R8 000.
- Masego's stock is modelled by $A = 5\,000(1{,}10)^n$.
- Tlhogi's stock decreases by 10% per annum on a reducing balance basis.
- V is the point at which the two stocks have the same value.



(1) Calculate the value of Masego's stock in three years.

(1)

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(2) Calculate the value of Tlhogi's stock in ten years.

(2)

(3) Determine the value of each stock at point V.

Show all working.





(4)

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(b) Kefilwe opens a savings account to pay for a car and estimates that she will need R360 000 after five years.

- She deposits the same amount at the end of each month.
- The first deposit is made one month after opening the account.
- She will make 48 deposits only and then stop depositing, but the money remains invested until the end of the fifth year.
- Interest is 9,5% p.a. compounded monthly.

(1) Determine the required monthly deposit so that the account balance is R360 000 after five years.



(5)

(2) Hence, determine the total interest that is earned over the full five-year period.

Give your final answer correct to the nearest rand.

(2)
[14]

73 marks

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SECTION B

QUESTION 8

The first four terms of a quadratic sequence are 6; 14; 23; 33; …

(a) If the sum of the first n terms of the sequence of first differences is equal to 3 800, determine the number of terms in the quadratic sequence.

Show all working.

(6)

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(b) If the last term in the quadratic sequence is 2 904, determine how many terms in the quadratic sequence are not common to the sequence of first differences.

Show all working.

(8)
[14]

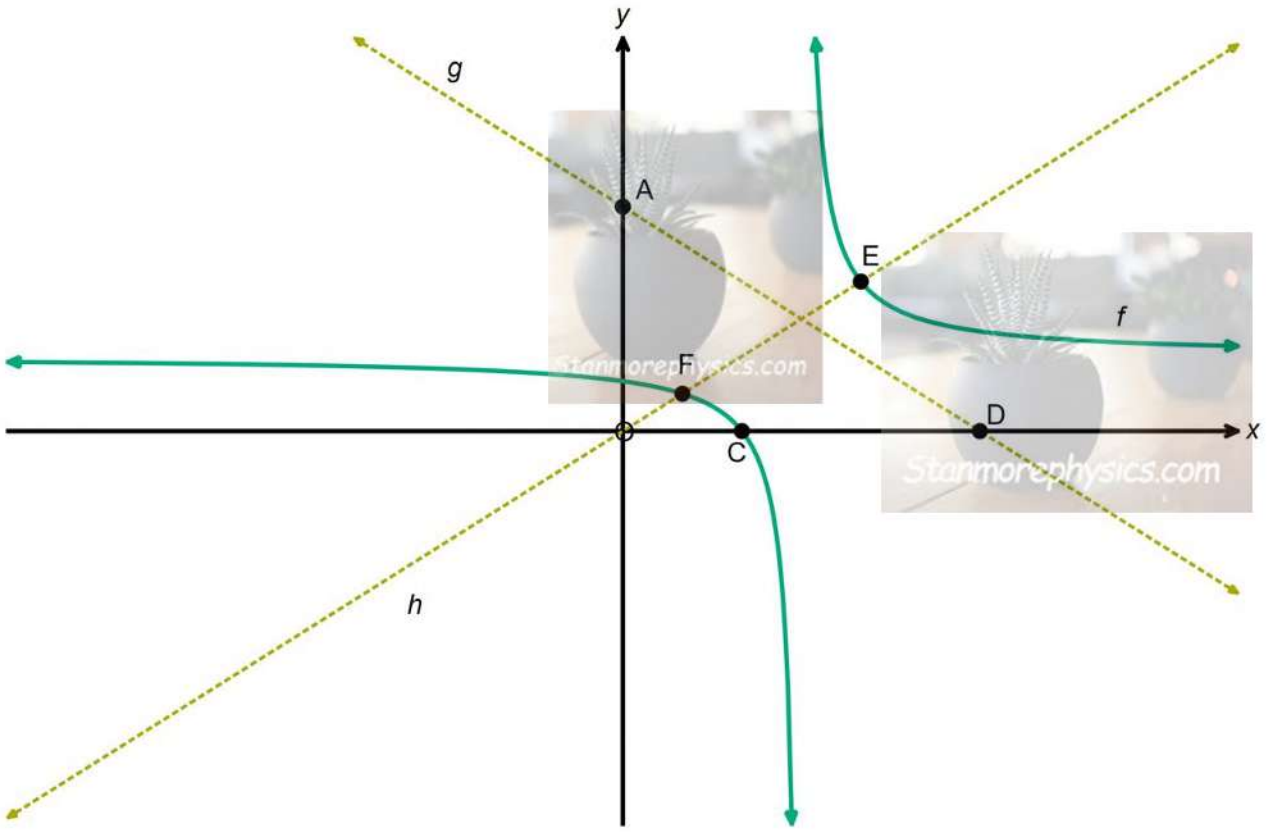
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QUESTION 9

In the diagram below:

- $f(x) = \frac{a}{x-p} + q$;
- the axes of symmetry of f are h and g;
- h passes through the origin O, and the y-intercept of g is at A;
- the range of f is $y \in \mathbb{R} : y \neq 3$;
- the domain of f is $x \in \mathbb{R} : x \neq 3$;
- E and F are the points of intersection of f and h; and
- C and D are x-intercepts of f and g, respectively.



(a) (1) Write down the equation of h.

(1)

(2) Write down the equation of g.

(2)

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(b) (1) Given that the area of ΔOED is 12 square units, determine the coordinates of E.

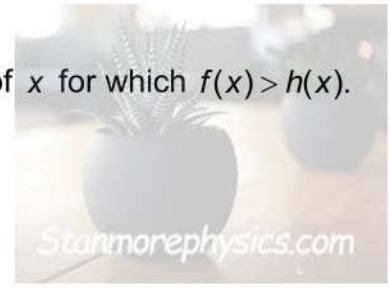
(4)

(2) Determine the equation of *f*.



(3)

(c) Determine the value(s) of x for which $f(x) > h(x)$.



(4)
[14]

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QUESTION 10

Given: $f(x)=\sum_{n=0}^{\infty}-2\left(-\frac{1}{2}x-2\right)^n$.

If it is given that f is a converging series:

(a) Explain why $f\left(\frac{3}{2}\right)$ does not exist. **Show all working.** (3)

(b) Determine $f(-3)$ if it exists. (4)

[7]

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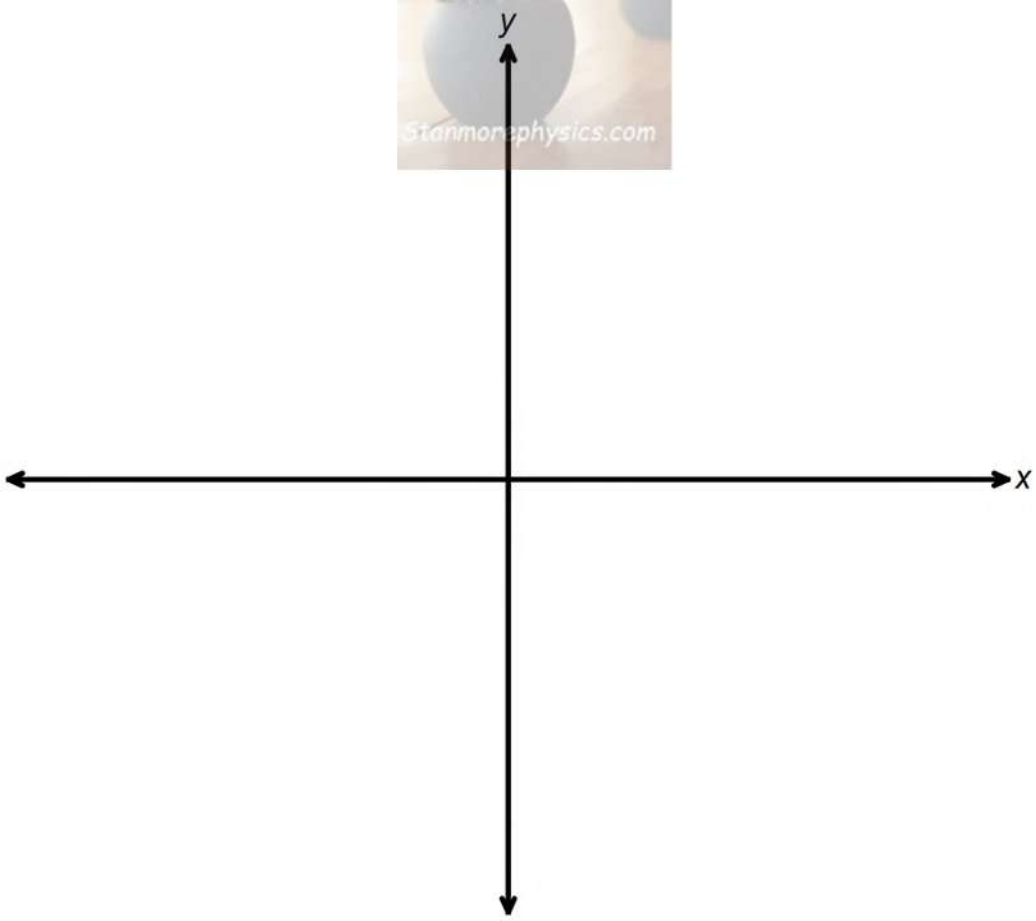
QUESTION 11

Consider the graph of $g(x) = -\frac{1}{2}x^2$; $-4 \leq x \leq 2$.

(a) Write down the range of g.

(2)

(b) Sketch the graphs of g and g^{-1}, the inverse of g, on the set of axes provided below. Show clearly the intercepts with the axes, turning points, and endpoints.



(6)
[8]

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QUESTION 12

(a) Given: $f(x) = ax^3 + bx^2 + cx + 7$.

(1) Determine the equation of the tangent to the curve f at $x = 0$.

Give your answer in terms of c.

(3)

It is further given that:

- $f'\left(-\frac{1}{2}k\right) = 0$ and $f'(3k) = 0$ with f' the derivative of f; and
- $k > 0$ and $a < 0$.

Answer the following questions.

(2) Determine the values of x for which $f'(x) \leq 0$. Give your answer in terms of k.

(2)

(3) Determine the value of x for which f has a point of inflection. Give your answer in terms of k.

(1)

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(b) It is further given that $k = \frac{1}{2}$ and $f'(0) = \frac{1}{2}$. Determine the values of *a*, *b*, and *c*.

(5)
[11]

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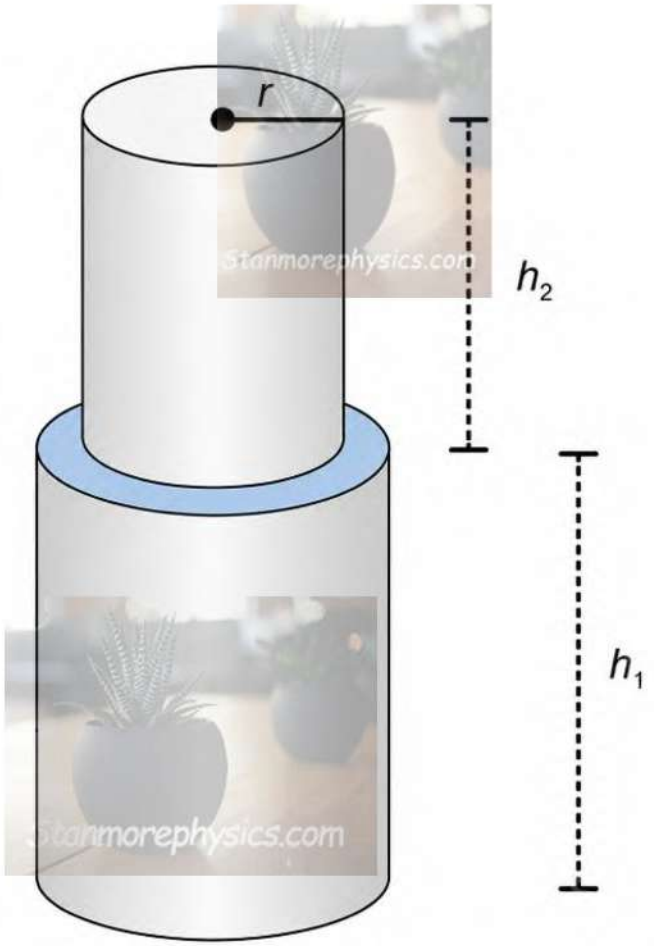
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QUESTION 13

Masego constructs a pipe system by joining two cylinders, as shown in the diagram. The smaller cylinder is positioned directly on top of the larger cylinder, with its centre aligned exactly with the centre of the larger cylinder.

An exposed circular ring-shaped surface is formed around the base of the smaller cylinder. The larger cylinder is open on both ends except for the exposed ring surface on the end, which joins with the smaller cylinder. The smaller cylinder is open on both ends.

- The smaller cylinder has radius r and height h_2.
- The larger cylinder has height h_1.
- The radius of the larger cylinder is twice the radius of the smaller cylinder.
- The combined internal volume of the two cylinders is 20π cubic units.
- The combined height of the upper and lower cylindrical pipes is 30 units.
- $0 < r < 10$.



Pipe thickness is ignored.

Useful formulae:

$S = 2\pi r^2 + 2\pi rh$ $V = \pi r^2 h$

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(a) Show that $h_1 = \frac{20}{3r^2} - 10$.

(3)

(b) Determine the equation, in terms of r, that must be solved to find the minimum total outer surface area. **(You do not have to solve the equation.)**

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(6)
[9]

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QUESTION 14

(a) The word '**SOWETO**' is written on a card.

All of the letters of the word '**SOWETO**' are arranged at random to form a new arrangement. What is the probability that the arrangement that is formed starts and ends with the letter O?

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(4)

(b) There are only red counters, r, and green counters, g, in a bag.

A counter is randomly selected from the bag.

- The probability that the counter is green is $\frac{3}{7}$.
- The counter is put back in the bag.
- Two more red counters and three more green counters are put in the bag.
- A counter is randomly selected from the bag.
- The probability that the counter is green is $\frac{6}{13}$.

Determine the number of red counters that were originally in the bag. **Show all working.**

(5)

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(c) Two fair six-sided dice, one blue and one white, are rolled simultaneously.

- Let w represent the number shown on the white die and b represent the number shown on the blue die.
- An arithmetic sequence is formed in which b is the first term and w is the second term.

Determine the probability that the sum of the first eight terms of the sequence is greater than 80.

Clearly justify your answer using appropriate reasoning and calculations.



(5)
[14]

77 marks

Total: 150 marks

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ADDITIONAL SPACE (ALL QUESTIONS)

REMEMBER TO CLEARLY INDICATE AT THE QUESTION THAT YOU USED THE ADDITIONAL SPACE TO ENSURE THAT ALL ANSWERS ARE MARKED.





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