



DEPARTMENT OF EDUCATION
DEPARTEMENT VAN ONDERWYS
LEFAPHA LA THUTO
ISEBE LEZEMFUNDO

**PROVINSIALE VOORBEREIDENDE EKSAMEN/
PROVINCIAL PREPARATORY EXAMINATION**

GRAAD/GRADE 12

WISKUNDE/MATHEMATICS

VRAESTEL/PAPER 1

SEPTEMBER 2024

Stanmorephysics.com

PUNTE/MARKS: 150

TYD/TIME: 3 uur/hours

**Hierdie vraestel bestaan uit 11 bladsye en 1 inligtingsblad./
This question paper consists of 11 pages and 1 information sheet.**



INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 11 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. 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. An information sheet with formulae is included at the end of the question paper.
10. Write neatly and legibly.



QUESTION 1

1.1 Solve for x :

1.1.1 $(x + 2)^2 - 9 = 0$ (3)

1.1.2 $2x^2 - 3x - 4 = 0$ (answers correct to TWO decimal places) (3)

1.1.3 $x^2 - 2x \leq 15$ (4)

1.1.4 $\sqrt{5x} + \sqrt{5x+2} = 150$ (4)

1.2 Solve for x and y simultaneously:

$x - y = 3$ and $x^2 - xy = 2y^2 + 7$ (6)

1.3 Given: $(a - b)(a + b) = 2b(34a - b)$, $a > 0$ and $b > 0$

Determine $(a + b)^2$ in terms of a and b . (4)

[24]

QUESTION 2

2.1 Given the arithmetic sequence: 1 ; 5 ; 9 ; ... ; 181

2.1.1 Determine the n th term of the sequence. (2)

2.1.2 Calculate the:

a) number of terms in the sequence (2)

b) sum of the series $13 + 17 + \dots + 181$ (3)

2.2 The general term of a quadratic sequence is $T_n = an^2 - 5n + c$

If it is given that $T_2 = T_1 + 1$ and $T_6 = 48$, calculate the values of a and c . (4)

[11]

QUESTION 3

3.1 Consider $\sum_{k=0}^p (3^{5-k}) = \frac{1093}{3}$

3.1.1 Write down the first three terms of the series. (1)

3.1.2 Does the series converge? Motivate your answer. (2)

3.1.3 Calculate the value of p . (4)

3.1.4 Calculate: $\sum_{k=1}^{\infty} (3^{5-k})$ (2)

- 3.2
- The first term of a geometric series is 9.
 - The ratio of the sum of the first four terms to the sum of the first two terms is 13 : 9.

Calculate the common ratio (r) of the series. (5)
[14]

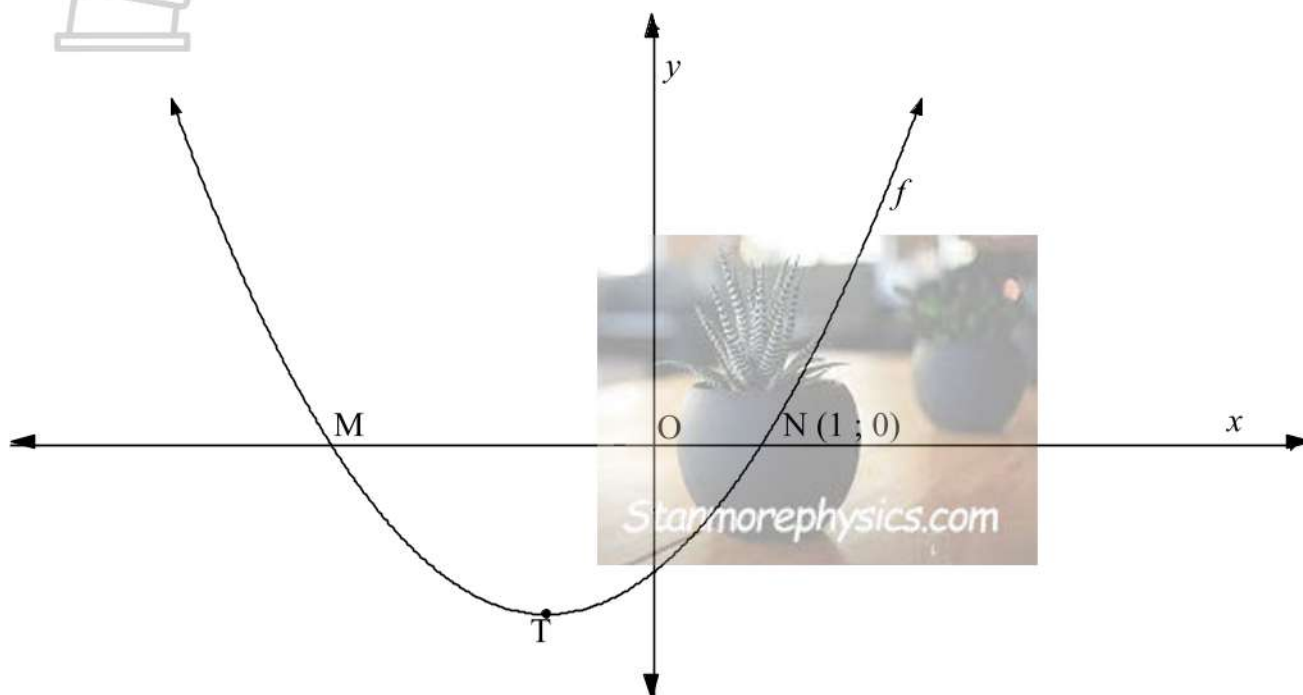


QUESTION 4

Sketched below is the graph of $f(x) = (x+1)^2 + q$.

M and N (1 ; 0) are the x -intercepts of f .

T is the turning point of f .

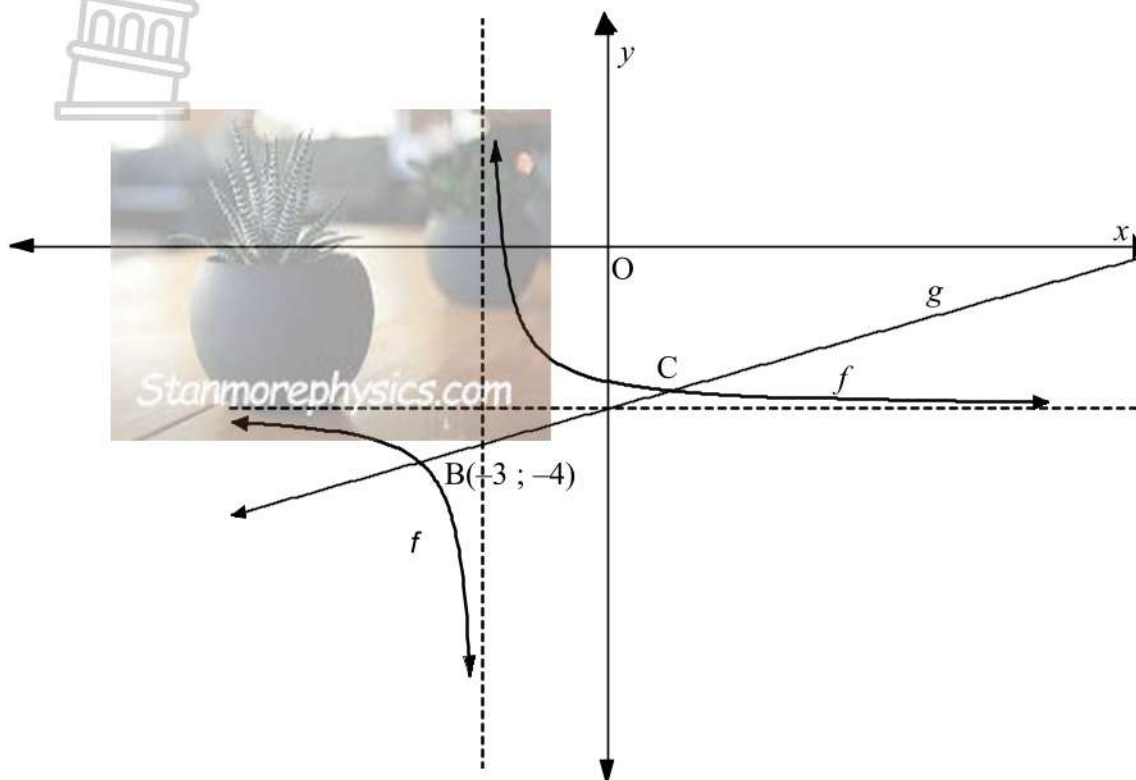


- 4.1 Write down the coordinates of M. (2)
- 4.2 Calculate the coordinates of T. (2)
- 4.3 Consider: $g(x) = -f(x) - 5$
- 4.3.1 Determine the equation of g in the form $y = ax^2 + bx + c$. (2)
- 4.3.2 Describe the nature of the roots of g . (2)
- 4.4 For which value(s) of x will $f(x-4) < -3$? (3)

[11]

QUESTION 5

The graphs of $f(x) = \frac{a}{x+2} + q$ and $g(x) = mx - 3$ are drawn below. The graphs of f and g intersect at $B(-3 ; -4)$ and C . The horizontal asymptote of f goes through the y -intercept of g .



- 5.1 Write down the equations of the asymptotes of f . (2)
- 5.2 Determine the values of a and m . (4)
- 5.3 Calculate the coordinates of C . (5)
- 5.4 Determine for which values of x will $f(x) \leq g(x)$. (3)

[14]

QUESTION 6

Given: $g(x) = \log_{\frac{1}{3}} x$

- 6.1 Write down the domain of g . (2)
- 6.2 Calculate the x -intercept of g . (2)
- 6.3 Draw the graph of g^{-1} , indicating the intercept(s) with the axes as well as the asymptote. (2)
- 6.4 $P(a; -1)$ is a point on g ; calculate the value of a . (2)
- 6.5 For which values of x will $1 < g^{-1}(x) < 3$? (2)

[10]**QUESTION 7**

- 7.1 On the 1 April 2019, Lebere deposited R5 000 into a savings account at an interest rate of $r\%$ per annum, compounded quarterly.
- 7.1.1 On 1 April 2023, the amount in the savings account was R12 980. Calculate r . (3)
- 7.1.2 He used R7 580 of the money to buy a new laptop. The value of the laptop depreciated at a rate of 22% per annum, according to the reducing balance method. After how many years will its book value be R1 707? (3)
- 7.2 Andy takes up a loan of R850 000. The loan is repaid over 20 years at 8,5% p.a., compounded monthly.
- 7.2.1 Calculate the value of Andy's monthly instalment. (4)
- 7.2.2 Calculate how much Andy will still owe the bank after his 26th payment (3)
- 7.2.3 Hence, calculate the total interest Andy will have paid over the first 26 months (2)

[15]

QUESTION 8

8.1 Determine $f'(x)$ from the first principles if $f(x) = 4 - 3x^2$. (5)

8.2 Determine:

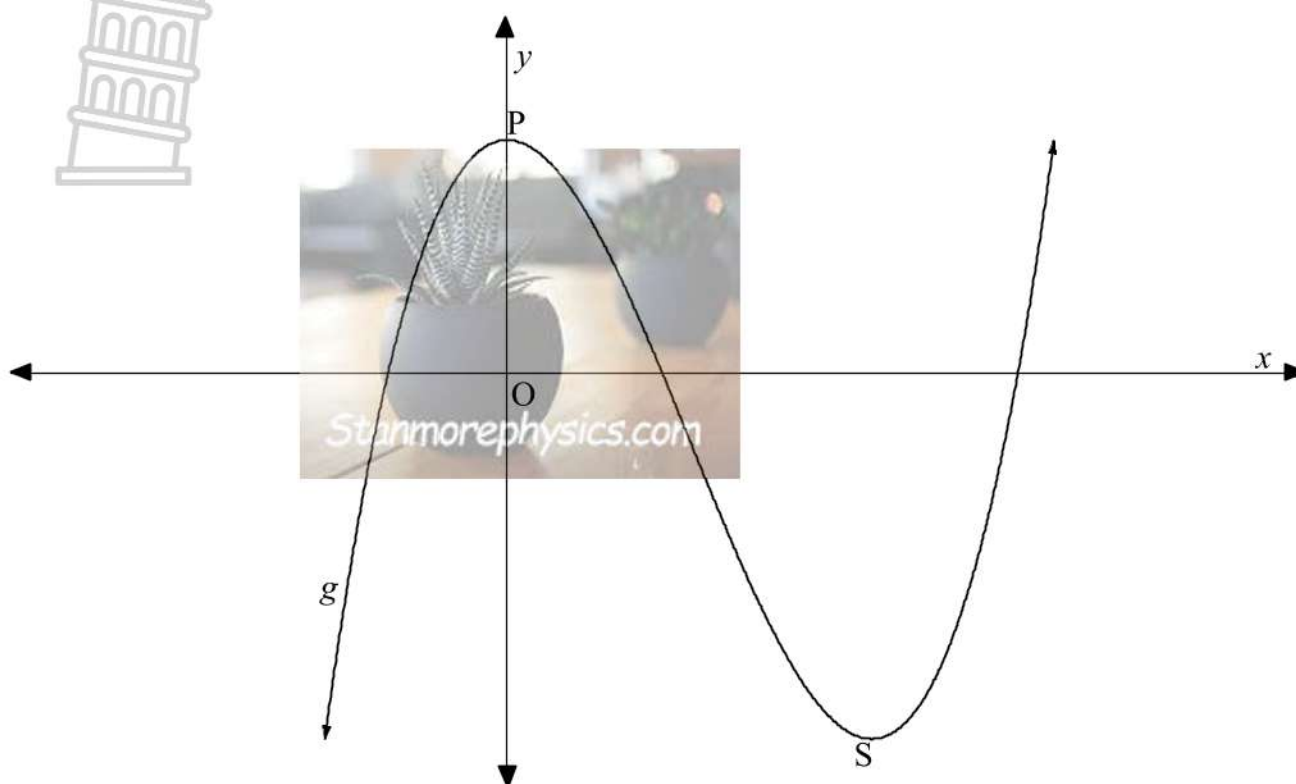
8.2.1 $\frac{dy}{dx}$ if $y = \frac{-4x^5 + 3x}{x^{-2}}$ (3)

8.2.2 $D_x(\sqrt{x^3 + b^2})$ (3)

8.3 The line $y = -4x + k$ is a tangent to $f(x) = \frac{9}{x} - 3x$ at $S(a ; b)$. Determine the value(s) of a . (4)
[15]

QUESTION 9

In the diagram, the graph of $g(x) = 2x^3 - 12x^2 + 25$ is drawn. P and S are the turning points of g .

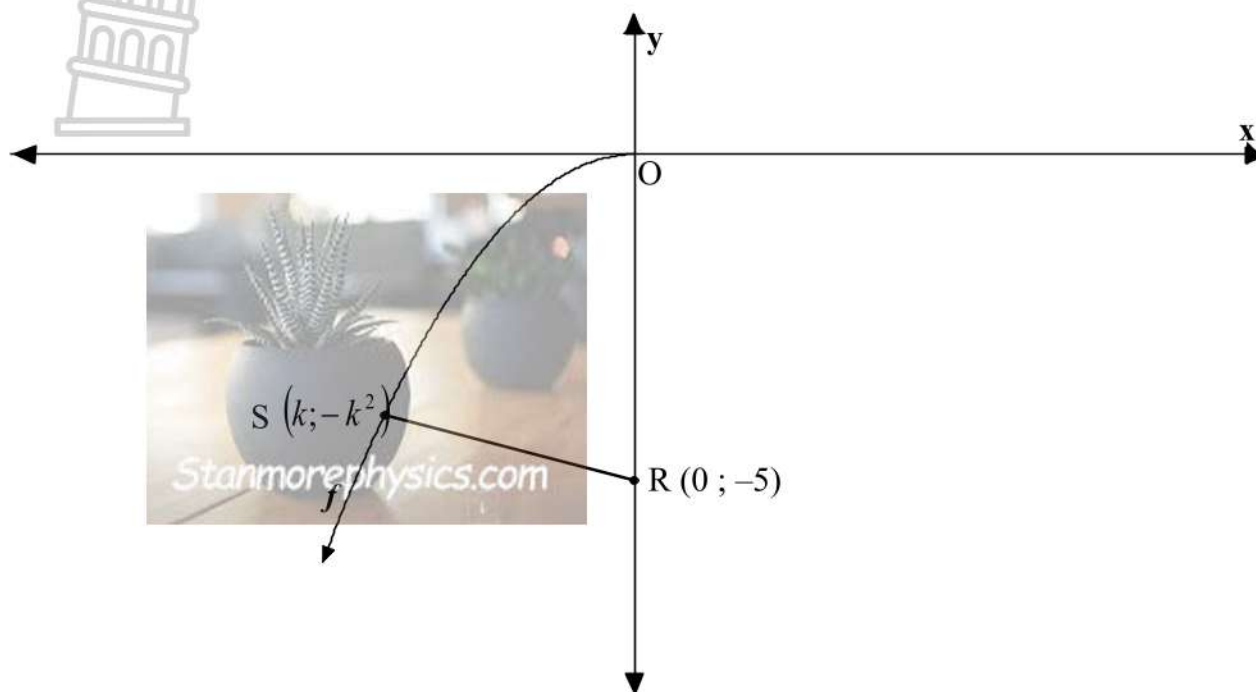


- 9.1 Calculate the coordinates of P and S. (5)
- 9.2 For which value(s) of x will:
- 9.2.1 g concave downwards? (3)
- 9.2.2 $g'(x) > 0$? (2)
- 9.3 T(1 ; 15) is a point on g . Determine the equation of the tangent to g at the point T in the form $y = mx + c$. (3)
- 9.4 For which values of k will $2x^3 - 12x + 25 - k = 0$ have two unequal roots? (2)

[15]

QUESTION 10

The graph of $f(x) = -x^2$, $x \leq 0$ is drawn below. R (0 ; -5) is a point on the y-axis and $S(k ; -k^2)$ is a point on f . RS is drawn.



- 10.1 Determine the distance RS in terms of k , in simplest form. (2)
- 10.2 Calculate the value of k such that the distance RS is a minimum. (4)
- [6]

QUESTION 11

11.1 In his cupboard, Kevin has 2 pairs of trousers, a black one and a red one. He also has 3 T-shirts, one blue, one yellow and a white one.



11.1.1 He must decide what combination of trousers and T-shirt he will be wearing to town. What is the probability of him ...

a) wearing red trousers? (1)

b) wearing black trousers with a white T-shirt? (1)

11.1.2 In how many ways can he hang these clothes on a rail in his cupboard? (2)

11.2 The probability that event A will occur is 0,5. The probability that event B will occur is 0,6 and the probability that neither of these events will occur is 0,1.

11.2.1 Calculate the probability that both events A and B will occur. (3)

11.2.2 Draw a complete Venn diagram to illustrate the above-mentioned. (2)

11.2.3 Use calculations to show that events A and B are not independent. (2)

11.3 A 3-digit number code is made up by using digits from 0 to 9. No digit may be repeated.

11.3.1 How many 3-digit number codes can be formed from these digits? (1)

11.3.2 Hence, determine the probability of 3-digit number codes formed which is greater than 600 and an even number. (3)

[15]

TOTAL: 150



INFORMATION SHEET

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$T_n = a + (n - 1)d$$

$$S_n = \frac{n}{2} [2a + (n - 1)d]$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1} ; r \neq 1$$

$$S_\infty = \frac{a}{1 - r} ; -1 < r < 1$$

$$F = \frac{x[(1 + i)^n - 1]}{i}$$

$$P = \frac{x[1 - (1 + i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

In $\triangle ABC$:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

$$\cos^2 \alpha - \sin^2 \alpha$$

$$\cos 2\alpha = \begin{cases} 1 - 2\sin^2 \alpha \\ 2\cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2\sin \alpha \cos \alpha$$

$$\bar{x} = \frac{\sum x}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$\hat{y} = a + bx$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

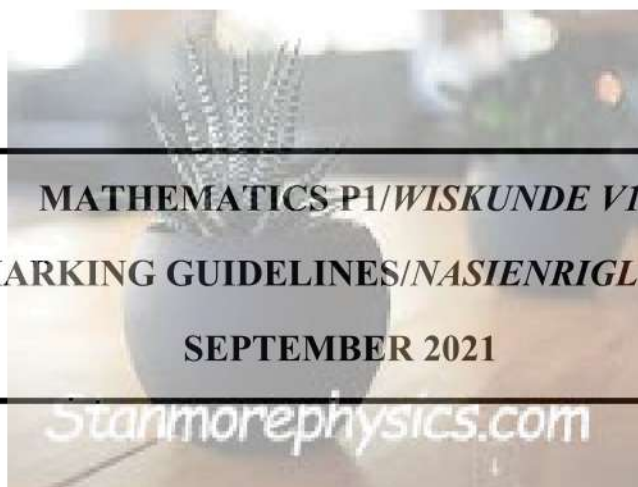


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**PROVINCIAL PREPARATORY EXAMINATION/
PROVINSIALE VOORBEREIDINGSEKSAMEN**

GRADE/GRAAD 12

**MATHEMATICS P1/WISKUNDE VI
MARKING GUIDELINES/NASIENRIGLYNE
SEPTEMBER 2021**



MARKS/PUNTE: 150



**These marking guidelines consist of 20 pages./
Hierdie nasienriglyne bestaan uit 20 bladsye.**

NOTE:

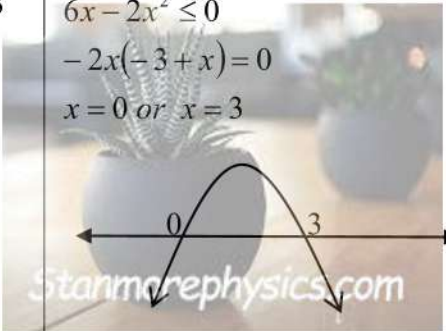
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate has crossed out an attempt to answer a question and did not redo it, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking at the second calculation error.
- (A) is an accuracy mark.
- Assuming answers/values in order to solve a problem is NOT acceptable.

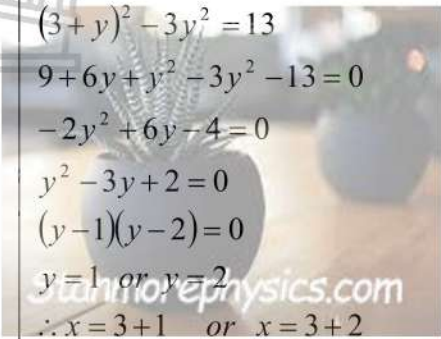
LET WEL:

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.
- As 'n kandidaat 'n poging om 'n vraag te beantwoord, doodgetrek en nie oorgedoen het nie, sien die dood getrekte poging na.
- Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing. Staak nasien by die tweede berekeningsfout.
- Om antwoorde/waardesom 'n probleem op te los, te veronderstel, word NIE toegelaat NIE.

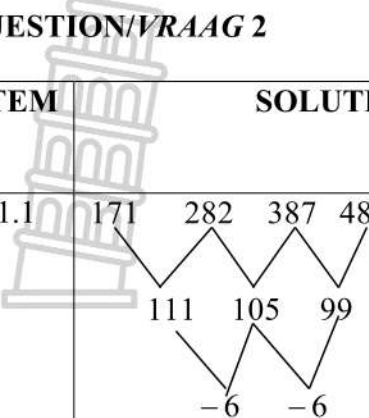


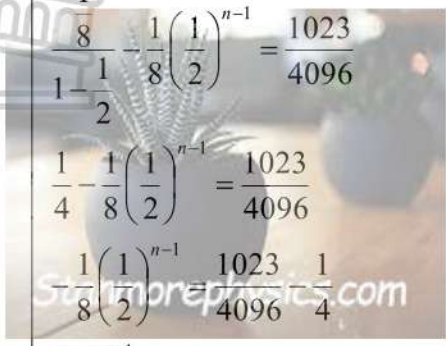
QUESTION/VRAAG 1

ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDERING
1.1.1	$x^2 - x - 6 = 0$ $(x-3)(x+2) = 0$ $x = 3 \text{ or } x = -2$	✓ factors ✓ ✓ answers (3)
1.1.2	$x(x+6)+1=0$ $x^2 + 6x + 1 = 0$ $x = \frac{-6 \pm \sqrt{(6)^2 - 4(1)(1)}}{2(1)}$ $x = -0,17 \text{ or } x = -5,83$ Penalise 1 mark for incorrect rounding	✓ standard form ✓ substitution into formula ✓ $x = -0,17$ ✓ $x = -5,83$ (4)
1.1.3	$6x - 2x^2 \leq 0$ $-2x(-3+x) = 0$ $x = 0 \text{ or } x = 3$  If 'and' instead of 'or' penalise 1 mark $x \leq 0 \text{ or } x \geq 3$	✓ critical value(s) ✓ method ✓ answer (3)
1.1.4	$(\sqrt{\sqrt{2}-x})(\sqrt{\sqrt{2}+x}) = x$ $\sqrt{2-x^2} = x$ $(\sqrt{2-x^2})^2 = x^2$ $2-x^2 = x^2$ $2x^2 - 2 = 0$ $x^2 - 1 = 0$ $(x+1)(x-1) = 0$ $x = -1 \text{ or } x = 1$ $\therefore x = 1$	✓ $\sqrt{2-x^2}$ ✓ squaring both sides ✓ standard form ✓ factors ✓ selection (5)

ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDING
1.2	$x - y = 3 \text{ and } x^2 - 3y^2 = 13$ $x = 3 + y$  $(3 + y)^2 - 3y^2 = 13$ $9 + 6y + y^2 - 3y^2 - 13 = 0$ $-2y^2 + 6y - 4 = 0$ $y^2 - 3y + 2 = 0$ $(y - 1)(y - 2) = 0$ $y = 1 \text{ or } y = 2$ $\therefore x = 3 + 1 \text{ or } x = 3 + 2$ $x = 4 \text{ or } x = 5$ OR/OF $x - y = 3 \text{ and } x^2 - 3y^2 = 13$ $y = x - 3$ $x^2 - 3(x - 3)^2 = 13$ $x^2 - 3(x^2 - 6x + 9) - 13 = 0$ $x^2 - 3x^2 + 18x - 27 - 13 = 0$ $-2x^2 + 18x - 40 = 0$ $x^2 - 9x + 20 = 0$ $(x - 4)(x - 5) = 0$ $x = 4 \text{ or } x = 5$ $y = 4 - 3 \text{ or } y = 5 - 3$ $y = 1 \text{ or } y = 2$	$\checkmark x = 3 + y$ $\checkmark$ substitution $\checkmark$ standard form $\checkmark$ factors $\checkmark$ y-values $\checkmark$ x-values OR/OF $\checkmark y = x - 3$ $\checkmark$ substitution $\checkmark$ standard form $\checkmark$ factors $\checkmark$ x-values $\checkmark$ y-values (6)
1.3	$x^2 = 7$ $x = \sqrt{7}$ $x^5 = x^2 \cdot x^2 \cdot x$ $x^5 = 7 \cdot 7 \cdot \sqrt{7}$ $x^5 = 49\sqrt{7}$	$\checkmark x = \sqrt{7}$ $\checkmark x^5 = x^2 \cdot x^2 \cdot x$ $\checkmark$ answer (3)
		[24]

QUESTION/VRAAG 2

ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDING
2.1.1	 $2^{\text{nd}} \text{ diff} = -6$	✓ ✓ answer (2)
2.1.2	$2a = -6$ $a = -3$ $3a + b = 111$ $3(-3) + b = 111$ $b = 111 + 9$ $b = 120$ $-3 + 120 + c = 171$ $c = 171 - 117$ $c = 54$ $T_n = -3n^2 + 120n + 54$	✓ $a = -3$ ✓ $b = 120$ ✓ $c = 54$ ✓ answer (4)
2.1.3	$T_n = -3n^2 + 120n + 54 \quad \text{and} \quad P_n = -60n + 2754$ $-3n^2 + 120n + 54 = -60n + 2754$ $3n^2 - 180n + 2700 = 0$ $n^2 - 60n + 900 = 0$ $(n - 30)^2 = 0$ $n = 30$	✓ equating the equations ✓ standard form ✓ factors ✓ answer (4)
2.2.1	$\frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \dots$ $a = \frac{1}{8} \quad r = \frac{1}{2}$ $S_{16} = \frac{\frac{1}{8} \left(\left(\frac{1}{2} \right)^{16} - 1 \right)}{\frac{1}{2} - 1}$ $S_{16} = 0.2499 \text{ or } 0.25 \text{ or } 0.250 \text{ or } 0.2500$	✓ value of a and r ✓ substitution ✓ answer (3)

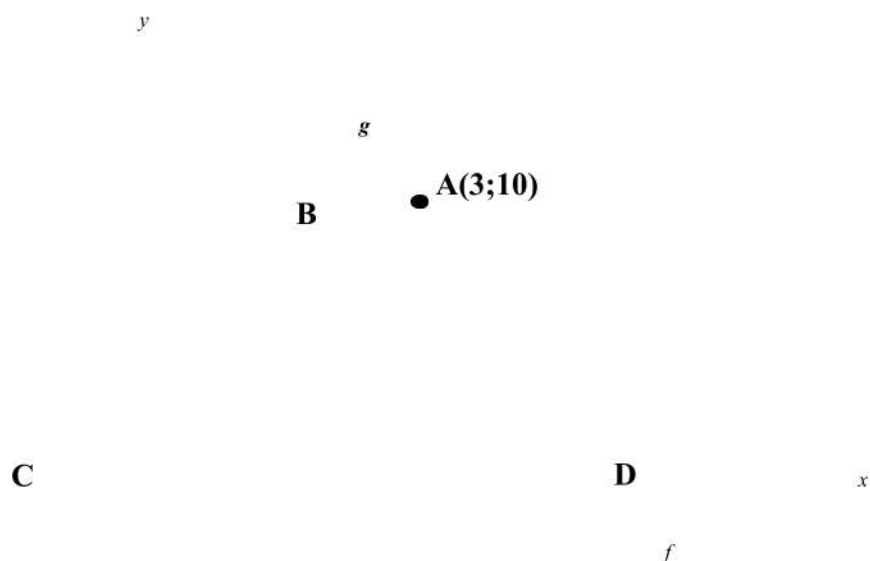
ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDING
2.2.2	$S_{\infty} - T_n = \frac{1023}{4096}$  $\frac{1}{8} - \frac{1}{8} \left(\frac{1}{2} \right)^{n-1} = \frac{1023}{4096}$ $\frac{1}{4} - \frac{1}{8} \left(\frac{1}{2} \right)^{n-1} = \frac{1023}{4096}$ $-\frac{1}{8} \left(\frac{1}{2} \right)^{n-1} = \frac{1023}{4096} - \frac{1}{4}$ $\left(\frac{1}{2} \right)^{n-1} = \frac{1}{512}$ $\left(\frac{1}{2} \right)^{n-1} = \left(\frac{1}{2} \right)^9 \text{ or } n-1 = \log_{\frac{1}{2}} \left(\frac{1}{512} \right)$ $n-1 = 9$ $n = 10$	✓ substitution ✓ $S_{\infty} = \frac{1}{4}$ ✓ $\left(\frac{1}{2} \right)^{n-1} = \frac{1}{512}$ ✓ $\left(\frac{1}{2} \right)^{n-1} = \left(\frac{1}{2} \right)^9$ or $n-1 = \log_{\frac{1}{2}} \left(\frac{1}{512} \right)$ ✓ $n = 10$ (5)
		[18]



QUESTION/VRAAG 3

ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDING
3.1	$\sum_{k=1}^n 6k + 13$ $19 + 25 + 31 + \dots + 6n + 13$ $a = 19 \quad d = 6$ $S_n = \frac{n}{2}(19 + 6n + 13)$ $S_n = \frac{n}{2}(6n + 32)$ $S_n = 3n^2 + 16n$ OR/OF $\sum_{k=1}^n 6k + 13$ $19 + 25 + 31 + \dots + 6n + 13$ $a = 19 \quad d = 6$ $S_n = \frac{n}{2}(2(19) + (n-1)6)$ $S_n = \frac{n}{2}(38 + 6n - 6)$ $S_n = \frac{n}{2}(6n + 32)$ $S_n = 3n^2 + 16n$	$\checkmark 19 + 25 + 31 + \dots$ $\checkmark a \text{ and } d$ $\checkmark$ substitution into correct formula (3)
3.2	$S_n = 3n^2 + 16n$ $S_{34} - S_{33} = 3(34)^2 + 16(34) - (3(33)^2 + 16(33))$ $= 4012 - 3795$ $= 217$	$\checkmark$ correct substitution $\checkmark$ answer (2)
3.3	$T_1 ; T_2 ; T_3 ; T_4 ; 120 \quad T_k = 6k + 13$ $19 \quad 25 \quad 31 \quad 37$ $T_4 = 120 - 37$ $T_4 = 83$ $T_3 = 83 - 31$ $T_3 = 52$	$\checkmark$ sequence of first differences. $\checkmark T_4 = 83$ $\checkmark T_3 = 52$
		[8]

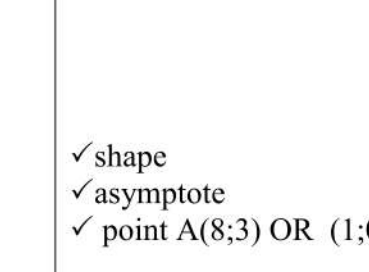
QUESTION/VRAAG 4

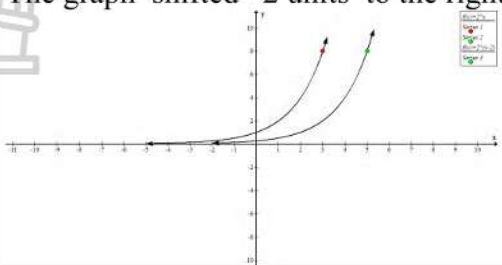


ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDERING
4.1	$f(x) = -x^2 + 4x + 5$ $x = \frac{-4}{2(-1)} \quad \text{OR} \quad f'(x) = -2x + 4$ $x = 2 \quad 0 = -2x + 4$ $x = 2$ $y = -(2)^2 + 4(2) + 5$ $y = 9$ $B(2;9)$	✓ substitution/derivative ✓ x-value ✓ $y = 8$ (3)
4.2	$p = -2$ and $q = 9$	✓ $p = -2$ ✓ $q = 9$ (2)

ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDING
4.3	The graph of f reflects over the x-axis and shifts 10 units up to form the graph of $t(x) = -f(x) + 10$. The roots will be non-real. OR $t(x) = -f(x) + 10$ The roots will be non-real.	✓✓ answer (2)
4.4	The graph shifted 2 units to the right and 6 units down $\therefore m = -2$ and $n = -6$	✓ $m = -2$ ✓ $n = -6$ (2)
4.5	$y = 8x + k$ $f(x) = -x^2 + 4x + 5$ $f'(x) = -2x + 4$ $8 = -2x + 4$ $4 = -2x$ $x = -2$ $y = -(-2)^2 + 4(-2) + 5$ $y = -7$ $P(-2; -7)$	✓ derivative ✓ $8 = -2x + 4$ ✓ x-value ✓ y-value (4)
4.6.1	$2 < x \leq 3$ or $x \in (2; 3]$	✓ critical value(s) ✓ notation (2)
4.6.2	$0 = -x^2 + 4x + 5$ $0 = x^2 - 4x - 5$ $(x - 5)(x + 1) = 0$ $x = -1$ or $x = 5$ $\therefore x < -1$ and $x > 5$	✓ standard form=0 ✓ critical value(s) ✓ $x < -1$ ✓ $x > 5$ (4)
		[19]

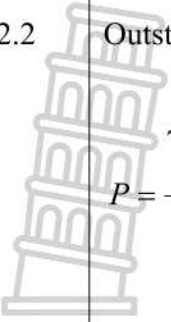
QUESTION/VRAAG 5

ITEM	SOLUTIONS/<i>OPLOSSINGS</i>	MARK CLARIFICATION/ <i>PUNTEVERHELDING</i>
5.1	$f(x) = b^x$ $8 = b^x$ $2^3 = b^3$ $b = 2$ $f(x) = 2^x$	✓ substitution ✓ answer (2)
5.2	$y = 2^x$ $x = 2^y$ $y = \log_2 x$	✓ $x = 2^y$ ✓ $y = \log_2 x$ (2)
5.3	 $\overset{\bullet}{A}(8;3)$ x ✓ shape ✓ asymptote ✓ point A(8;3) OR (1;0)	Answer only full marks (3)
5.4	$\log_2 x < 4$ $x < 2^4$ $0 < x < 16$	Answer only full marks ✓ 16 ✓ ✓ answer (3)

5.5	$h(x) = \frac{1}{4}f(x)$ $= 2^{-2}(2^x)$ $= 2^{x-2}$ The graph shifted 2 units to the right 	✓ 2^{x-2} ✓ 2nits ✓ right (3) [13]
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QUESTION/VRAAG 6

ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDING
6.1.1	$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{4100 \left[\left(1 + \frac{0.06}{4} \right)^{4 \times 20} - 1 \right]}{\frac{0.06}{4}}$ $F = 626\,114,50$	✓ substitution into correct formula ✓ 80 ✓ answer (3)
6.1.2	$A = 626\,114,50 \left(1 + \frac{0.062}{2} \right)^{2 \times 5}$ $= 849\,650,68$	✓ substitution ✓ answer (2)
6.2.1	$P = \frac{x[1 - (1+i)^{-n}]}{i}$ $660\,000 = \frac{x \left[1 - \left(1 + \frac{0.11}{12} \right)^{-180} \right]}{\frac{0.11}{12}}$ $x = \frac{660\,000 \left(\frac{0.11}{12} \right)}{1 - \left(1 + \frac{0.11}{12} \right)^{-180}}$ $x = 7\,501,54$	✓ substitution into correct formula ✓ $\frac{0.11}{12}$ ✓ answer (3)

6.2.2	Outstanding balance after the 84th payment  $P = \frac{7501,54 \left[1 - \left(1 + \frac{0.11}{12} \right)^{-96} \right]}{\frac{0.11}{12}}$ Outstanding Balance = 477 548,81 OR/OF $\text{Outstanding Balance} = 660\,000 \left(1 + \frac{0.11}{12} \right)^{84} - \frac{7501,54 \left(\left(1 + \frac{0.11}{12} \right)^{84} - 1 \right)}{\frac{0.11}{12}}$ = R 477 548,77	✓ -96 ✓ substitution into correct formula ✓ 477 548,81 (3) OR/OF ✓ substitution (A) ✓ answer (3)
6.2.3	$\therefore 477\,548,81 = \frac{10\,000 \left[1 - \left(1 + \frac{0.11}{12} \right)^{-n} \right]}{\frac{0.11}{12}}$ $\frac{477\,548,81 \left(\frac{0.11}{12} \right)}{10\,000} - 1 = - \left(1 + \frac{0.11}{12} \right)^{-n}$ $-0.5622469242 = - \left(1 + \frac{0.11}{12} \right)^{-n}$ $-n = \log_{\left(1 + \frac{0.11}{12} \right)} (0.5622469242)$ $-n = -63,10$ $n = 64$ payments $\therefore 96 - 64 = 32$ payments sooner	✓ substitution (A) ✓ application of logs ✓ 64 payments ✓ 32 payments sooner (4) 
		[15]

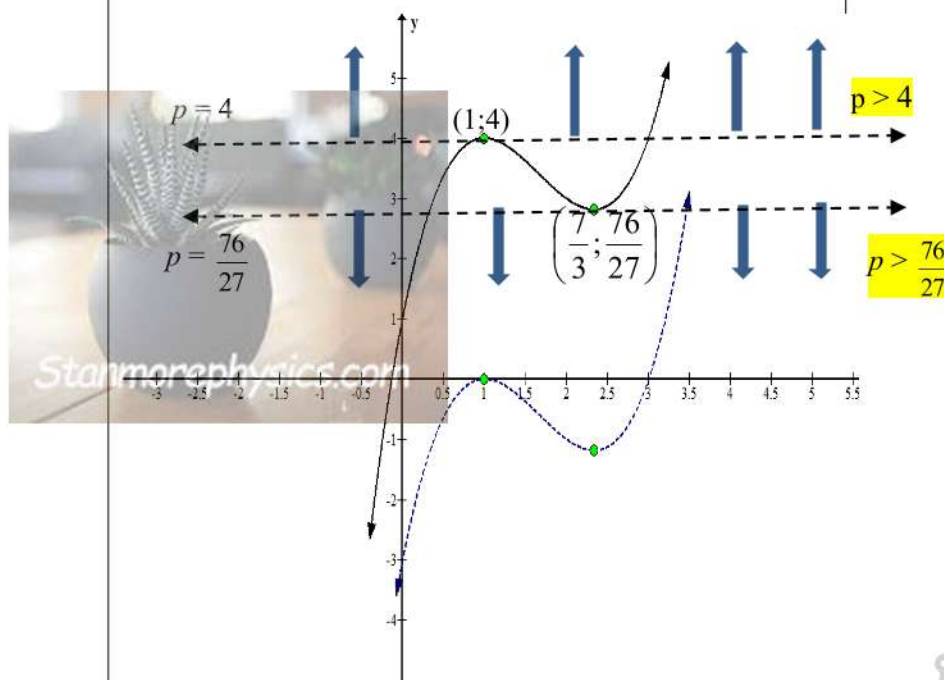
QUESTION/VRAAG 7: PENALISE -1 FOR NOTATION ONLY IN 7.1

ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDING
7.1	$f(x) = 4x^2 - 3$ $f(x+h) = 4(x+h)^2 - 3$ $f(x+h) = 4x^2 + 8xh + 4h^2 - 3$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{4x^2 + 8xh + 4h^2 - 3 - (4x^2 - 3)}{h}$ $= \lim_{h \rightarrow 0} \frac{8xh + 4h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(8x + 4h)}{h}$ $= \lim_{h \rightarrow 0} (8x + 4h)$ $= 8x + 4(0)$ $= 8x$	$\checkmark 4x^2 + 8xh + 4h^2 - 3$ $\checkmark$ substitution $\checkmark$ simplification $\checkmark$ common factor $\checkmark$ answer (5)
7.2.1	$y = (3x - 4)(5x + 2)$ $= 15x^2 + 6x - 20x - 8$ $= 15x^2 - 14x - 8$ $\frac{dy}{dx} = 30x - 14$	$\checkmark 15x^2 - 14x - 8$ $\checkmark 30x - 14$ (2)
7.2.2	$\frac{d}{dx} \left(x\sqrt{x} - \frac{2}{x^2} \right)$ $\frac{d}{dx} \left(x^{\frac{3}{2}} - 2x^{-2} \right)$ $= \frac{3}{2}x^{\frac{1}{2}} + 4x^{-3}$ C.A only if exponent is a rational	$\checkmark x^{\frac{3}{2}}$ $\checkmark -2x^{-2}$ $\checkmark \frac{3}{2}x^{\frac{1}{2}}$ $\checkmark +4x^{-3}$ (4)
		[11]

QUESTION/VRAAG 8

ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDING
8.1.1	$x^3 - 5x^2 + 7x - 3 = 0$ $f(1) = 0$ $(x-1)^2(x-3) = 0$ $A(1;0) \quad B(3;0)$ Does not have to be in a coordinate form. Accept $x=1$ or $x=3$	$\checkmark$ factors $\checkmark A(1;0)$ $\checkmark B(3;0)$ (3)
8.1.2	$h(x) = x^3 - 5x^2 + 7x - 3$ $h'(x) = 3x^2 - 10x + 7$ $0 = 3x^2 - 10x + 7$ $0 = (3x-7)(x-1)$ at C $x = \frac{7}{3}$ $f\left(\frac{7}{3}\right) = \left(\frac{7}{3}\right)^3 - 5\left(\frac{7}{3}\right)^2 + 7\left(\frac{7}{3}\right) - 3$ $= \frac{-32}{27}$ $C\left(\frac{7}{3}; -\frac{32}{27}\right)$	$\checkmark$ Derivative $\checkmark$ Equation derivation to 0. $\checkmark$ x-value $\checkmark$ y-value (4)
8.2.1	$x = \frac{1 + \frac{7}{3}}{2}$ $x = \frac{5}{3}$ $x < \frac{5}{3}$ OR $x < \frac{-b}{3a}$ $x < \frac{-(-5)}{3(1)}$ $x < \frac{5}{3}$ OR/OF $h(x) = x^3 - 5x^2 + 7x - 3$ $h'(x) = 3x^2 - 10x + 7$ $h''(x) = 6x - 10 < 0$ $6x - 10 < 0$ $\therefore x < \frac{5}{3}$	$\checkmark$ substitution $\checkmark$ x-value $\checkmark$ Answer (3) OR/OF $\checkmark \checkmark$ Second derivative < 0 $\checkmark$ answer (3)

ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDING
8.2.2	$h(x) > 0$ for $x > 3$ since $h(-x)$ is a reflection over y -axis $\therefore x < -3$	$\checkmark \checkmark$ answer (2)
8.3	$h(x) + 4 = p$ the turning points of $h(x) + 4$ are $A(1;4)$ and $\left(\frac{7}{3}; \frac{76}{27}\right)$ $p > 4$ or $p < \frac{76}{27}$ OR/OF	$\checkmark \checkmark p > 4$ $\checkmark p = 0$ $\checkmark p < \frac{76}{27}$ (4)



QUESTION/VRAAG 9

ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDING
9.1	$S.A = 2l.w + 2l.h + 2w.h$ $= 2(x.5x + h.5x + x.h)$ $720 = 2(5x^2 + 6xh)$ $360 = 5x^2 + 6xh$ $360 - 5x^2 = 6xh$ $h = \frac{60}{x} - \frac{5}{6}x$ $V = 5x.x\left(\frac{60}{x} - \frac{5}{6}x\right)$ $V = 300x - \frac{25}{6}x^3$	✓ formula ✓ substitution ✓ simplification $h = \frac{60}{x} - \frac{5}{6}x$ ✓ substitution (5)
9.2	$V = 300x - \frac{25}{6}x^3$ $\frac{dV}{dx} = 300 - \frac{25}{2}x^2$ $0 = 300 - \frac{25}{2}x^2$ $\frac{25}{2}x^2 = 300$ $x^2 = 24$ $x = 2\sqrt{6} \quad \therefore v = 300(2\sqrt{6}) + \frac{25}{2}(2\sqrt{6})^3 = 2939,39$	✓ derivative ✓ equating the derivative to 0. ✓ x-value ✓ substitution ✓ Answer (5)
		[10]

QUESTION/VRAAG 10

Events A and B are given such that $P(A \text{ or } B) = \frac{3}{5}$ and $P(A) = \frac{2}{5}$.

ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDING
10.1.1	$P(A \text{ OR } B) = P(A) + P(B)$ $\frac{3}{5} = \frac{2}{5} + P(B)$ $P(B) = \frac{3}{5} - \frac{2}{5}$ $P(B) = \frac{1}{5}$	✓ substitution ✓ answer (2)
10.1.2	$P(A \text{ or } B) = P(A) + P(B) - P(A).P(B)$ $\frac{3}{5} = \frac{2}{5} + P(B) - \frac{2}{5}P(B)$ $\frac{1}{5} = \frac{3}{5}P(B)$ $P(B) = \frac{1}{3}$	✓ substitution ✓ simplification ✓ answer (3)
10.2	$P(A \text{ or } B) = P(A) + P(B) - P(A).P(B)$ $0.84 = y + y - y.y$ $0.84 = 2y - y^2$ $y^2 - 2y + 0.84 = 0$ $y = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(0.84)}}{2(1)}$ $y = 1.4 \text{ OR } y = 0.6$ $\therefore y = 0,6$	✓ substitution ✓ standard form ✓ substitution into formula/factors ✓ answers ✓ selection (5)
		[10]

QUESTION/VRAAG 11

ITEM	SOLUTIONS/OPLOSSINGS	MARK CLARIFICATION/ PUNTEVERHELDING
11.1	$7 \times 7 \times 7 \times 7 = 2401$ codes OR 7^4 NOTE: Answer only award full marks Also if left as 7^4 or $7 \times 7 \times 7 \times 7$ award full marks	$\checkmark 7 \times 7 \times 7 \times 7$ $\checkmark 2401$ (2)
11.2	Case 1: The code must start with 2 and end with 0 $\begin{array}{ccc} \underline{2} & & \underline{0} \\ & 5 & 4 & 1 \text{ way} \end{array}$ Number of codes starting with 2 and ending with 0 is $1 \times 5 \times 4 \times 1 = 20$ Case 2: number of codes starting with 2 and ending with 4 $\begin{array}{ccc} \underline{2} & \underline{5} & \underline{4} & \underline{4} \\ 1 \text{ way} & & & 1 \text{ way} \end{array}$ $1 \times 5 \times 4 \times 1 = 20$ Case 3: number of codes starting with 2 and ending will 6 $1 \times 5 \times 4 \times 1 = 20$ Total number of codes = $20 + 20 + 20 = 60$ codes OR/OF $1 \times 5 \times 4 \times 1 \times 3 = 60$	$\checkmark 1 \times 5 \times 4 \times 1$ $\checkmark 1 \times 5 \times 4 \times 1$ $\checkmark 1 \times 5 \times 4 \times 1$ $\checkmark 60$ OR $\checkmark \checkmark 1 \times 5 \times 4 \times 1 \times 3$ $\checkmark \checkmark 60$ NOTE: Answer only 2 marks (4)
		[6]

TOTAL/TOTAAL: 150