GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

2025

MARKING GUIDELINES

MATHEMATICS PAPER 1

26 pages

Approved: 6 September 2025

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

AMENDMENT TO MARKING GUIDELINES

PREPARATORY EXAMINATIONS – 2025

ATTENTION

THE CHIEF INVIGILATOR

SUBJECT / ***VAK***	**MATHEMATICS/*WISKUNDE***
PAPER / ***VRAESTEL***	**1**
DATE OF EXAMINATION	**5 SEPTEMBER 2025**

The errata for the Marking Guidelines of MATHEMATICS P1 has reference.

There is a contention that **Question 11.3** (3 marks) was not answerable by most candidates in the province. This matter was addressed at the Marking Standardisation Meeting. To ensure that candidates are not disadvantaged and prejudiced in way, you are advised to ask your Mathematics Educator(s) to **ignore Question 11.3** when marking.

In other words, the paper must be marked out of a total of 147 instead of 150, and then the learners' marks must be converted to a mark out of 150. E.g., Should a learner attain 85/147 then that mark is recalculated as 87/150.

Use the formula: $\frac{a}{147} \times 100 = b.$ *Then,* $\frac{b}{100} \times 150 = c$

C *is the mark that is entered into SASAMS* ***out of 150****.*

Mr. Jonathan Williams

DIRECTOR: EXAMINATIONS MANAGEMENT

5 SEPTEMBER 2025

INSTRUCTIONS AND INFORMATION

NOTES:

- If a candidate answered a question *TWICE*, mark only the *FIRST* attempt.
- If a candidate crossed *OUT* an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy *(CA)* applies to ALL aspects of the marking guidelines.
- It is UNACCEPTABLE for candidates to assume values/ answers in order to solve a question.
- (A) - denotes an accuracy mark.

QUESTION 1

1.1.1	$f(x)=(x^2-3)(3x-1)(x+2)$ $0=(x^2-3)(3x-1)(x+2)$ $\therefore x^2=3$ or $x=\frac{1}{3}$ or $x=-2$ $\therefore x=\pm\sqrt{3}$ or $x=\frac{1}{3}$ or $x=-2$ $x=-2$ **NOTE:** Answer only, full marks.	✓ all 3 x-values ✓ answer	(2)
1.1.2	$x=\frac{1}{3}$ or $x=-2$	✓ both x-answers	(1)
1.1.3	$x=-2$ or $x=\frac{1}{3}$ or $x=\pm\sqrt{3}$	✓ all 4 x-answers	(1)
1.2.1	$-15x^2-9x+4=0$ $x=\frac{-(-9)\pm\sqrt{(-9)^2-4(-15)(4)}}{2(-15)}$ $\therefore x=-0,90$ or $x=0,30$ **NOTE:** Accept -0,89 or 0,29. Must show substitution into the formula to obtain full marks Any other valid method.	✓ substitution into correct formula ✓✓ answers	(3)
1.2.2	$(3x-2)^2\geq 3x$ $9x^2-12x+4\geq 3x$ $9x^2-15x+4\geq 0$ $(3x-4)(3x-1)\geq 0$ $x\leq\frac{1}{3}$ *or* $x\geq\frac{4}{3}$ **NOTE**: Any other valid method.	✓ standard form ✓ factors ✓✓ answer	(4)

1.2.3	$5^x = 5(4+5^{2-x})$ $5^x = 20+5.5^{2-x}$ $5^x = 20+\frac{5.5^2}{5^x}$ $\therefore 5^{2x} = 20.5^x + 125 \cdots\cdots (\times 5^x)$ $\therefore 5^{2x} - 20.5^x - 125 = 0$ $(5^x - 25)(5^x + 5) = 0$ $\therefore 5^x = 25$ or $5^x = -5$ $5^x = 5^2$ or NA $\therefore x = 2$ or $5^x > 0$ **NOTE:** Does not have to indicate that $5^x > 0$ if rejection is indicated. **OR** $5^x = 5(4+5^{2-x})$ $5^x = 20+5.5^{2-x}$ $5^x = 20+\frac{5.5^2}{5^x}$ let $5^x = k$ $\therefore k = 20+\frac{125}{k}$ $k^2 = 20k+125$ $k^2 - 20k - 125 = 0$ $(k+5)(k-25) = 0$ $\therefore 5^x \neq -5$ or $5^x = 25$ $5^x = 5^2$ $x = 2$	✓ simplificaction ✓ standard form ✓ factors ✓ answers with rejection **OR** ✓ simplificaction ✓ standard form ✓ factors ✓ answers with rejection	(4)

1.3	$\log_x 16 = 4$ ...(1) and $y+\sqrt{x+7}=x+1$...(2) $x^4 = 16$ $x^4 = 2^4$ $x = 2$...sub into (2) $y+\sqrt{2+7}=2+1$ $y+\sqrt{9}=3$ $\sqrt{9}=3-y$ $9=9-6y+y^2$ $0=y^2-6y$ $0=y(y-6)$ $y=0$ or $y\neq 6$ **OR** $\log_x 16 = 4$ ...(1) and $y+\sqrt{x+7}=x+1$...(2) $x^4 = 16$ $x^4 = 2^4$ $x = 2$...sub into (2) $y+\sqrt{2+7}=2+1$ $y+\sqrt{9}=3$ $3=3-y$ $0 = y$ **NOTE:** Full CA for this question. Do NOT stop marking after two errors.	✓ exponential form ✓ x-value ✓ substitution into (2) ✓ square both sides ✓ standard form ✓ y-values and rejection **OR** ✓ exponential form ✓ x-value ✓ substitution into (2) ✓ using +3 ✓ simplification ✓ y- value	(6)
1.4	$x^2+p(2x+7)+8$ $=x^2+2px+7p+8$ $\Delta=(2p)^2-4(1)(7p+8)$ $0=4p^2-28p-32$ $0=(p-8)(p+1)$ $p=8$ or $p=-1$ **OR**	✓ simplification ✓ condition for = roots; $\Delta=0$ ✓ factors ✓ both answers **OR**	

	$x^2 + p(2x+7)+8$ $= x^2 + 2px + 7p + 8$ $= x^2 + 2px + p^2 - p^2 + 7p + 8$ $= (x+p)^2 - p^2 + 7p + 8$ $\therefore -p^2 + 7p + 8 = 0$ $p^2 - 7p - 8 = 0$ $(p-8)(p+1) = 0$ $\therefore p = 8$ or $p = -1$ **NOTE:** Only CA if the square was completed.	✓ complete the square ✓ $-p^2 + 7p + 8 = 0$ ✓ factors ✓ answers	(4)
			[25]

QUESTION 2

2.1	$-3;\ -2;\ -3;\ -6;\ -11;\ldots$ first difference: $+1;\ -1;\ -3;\ -5;\ldots$ $\therefore a=1$ and $d=-2$ $\therefore T_n=a+(n-1)d$ $T_n=1+(n-1)(-2)$ $T_n=1-2n+2$ $\therefore T_n=-2n+3$	✓ 1^{st} difference ✓ substitute into correct formula ✓ answer	(3)
2.2	$T_n=-2n+3$ $\therefore T_{35}=-2(35)+3$ $\therefore T_{35}=-67$ **NOTE**: Substitution must be $n=35$. Answer only, full marks.	✓ answer	(1)
2.3	$-3;\quad -2;\quad -3;\quad -6;\quad -11;$ $+1;\quad -1;\quad -3;\quad -5;$ $\quad 1^{st}$ differences $-2\quad -2\quad -2$ $\quad 2^{nd}$ differences $T_n=an^2+bn+c$ $but\cdots 2a=-2$ $\therefore a=-1$ $\therefore T_n=-n^2+bn+c$ $\therefore T_1=-(1)^2+b(1)+c$ $\therefore -3=-1+b+c$ $\therefore -2=b+c\cdots\cdots(1)$ $\therefore T_2=-(2)^2+b(2)+c$ $\therefore -2=-4+2b+c$ $\therefore 2=2b+c\cdots\cdots(2)$ $(2)-(1)\ \therefore b=4$ $in\cdots(1)\ \therefore -2=4+c$ $\therefore c=-6$ $\therefore T_n=-n^2+4n-6$	✓ 2^{nd} difference ✓ value of a ✓ value of b ✓ value of c	(4)

2.4	$T_n = -n^2 + 4n - 6$ $T_n = -\left[n^2 - 4n + 4 - 4 + 6\right]$ $T_n = -\left[(n-2)^2 + 2\right]$ $\therefore T_n = -(n-2)^2 - 2$ $\therefore T_n(\max) = -2$ $\therefore$ NO positive terms. **OR** The turning point of a maximum quadratic function is $(2\ ;\ -2)$. $\therefore$ no values ABOVE the x-axis, hence no positive values. **NOTE**: Accept a sketch indicating the correct turning point and shape (ie. $a < 0$). Award full marks.	✓ complete the square ✓ $T_n(\max) = -2$ **OR** ✓ turning point ✓ explanation concluding no positive terms	(2)
			[10]

QUESTION 3

3.1.1	$18cm$; $6\sqrt{3}$cm ; $6cm$.. Area of circle 1: 324π Area of circle 2: 108π Area of circle 3: 36π $\frac{108\pi}{324\pi}=\frac{1}{3}$; $\frac{36\pi}{108\pi}=\frac{1}{3}$ $\therefore Consant\ ratio=\frac{1}{3}$ $-1<r<1$ $\therefore$ ratio is converging $\therefore$ sequence converges **NOTE:** If the candidate uses the radii to establish the pattern, $r=\frac{1}{\sqrt{3}}=\frac{\sqrt{3}}{3}$; award 1 mark.	✓ areas of 3 outermost circles ✓ value of r ✓ $-1<r<1$	(3)
3.1.2	18; $6\sqrt{3}$; 6 $r=\frac{1}{\sqrt{3}}$ $T_n=ar^{n-1}$ $\frac{2}{3}=18\left(\frac{1}{\sqrt{3}}\right)^{n-1}$ $\frac{1}{27}=\left(\frac{1}{\sqrt{3}}\right)^{n-1}$ $3^{-3}=\left(3^{-\frac{1}{2}}\right)^{n-1}$ $3^{-3}=3^{-\frac{1}{2}n+\frac{1}{2}}$ $\therefore -3=-\frac{1}{2}n+\frac{1}{2}$ $\therefore n=7$ **OR**	✓ ratio of radii ✓ substitution into correct formula ✓ $3^{-3}=3^{-\frac{1}{2}n+\frac{1}{2}}$ ✓ answer **OR**	(4)

	$r=\dfrac{1}{\sqrt{3}}$ $T_n=ar^{n-1}$ $\dfrac{2}{3}=18\left(\dfrac{1}{\sqrt{3}}\right)^{n-1}$ $\dfrac{1}{27}=\left(\dfrac{1}{\sqrt{3}}\right)^{n-1}$ $n-1=\log_{\frac{1}{\sqrt{3}}}\frac{1}{27}$ $\therefore n-1=6$ $\therefore n=7$ **NOTE:** Candidates may use the areas of the circles to do this question. Answer only – award ZERO marks	✓ ratio of radii ✓ substitution in correct formula ✓ correct use of logs ✓ answer	
3.2	$(1\times2)+(5\times6)+(9\times10)+(13\times14)+\ldots+(81\times82)$ $1\ ;\ 5\ ;\ 9\ ;\ 13\ ;\ \ldots.\ 81$ (1^{st} terms in the bracket) $a=1$ and $d=4$ $T_n=a+(n-1)d$ $T_n=1+(n-1)4$ $T_n=1+4n-4$ $\therefore T_n=4n-3$ Number of terms: $4n-3=81$ $4n=84$ $\therefore n=21$ $2\ ;\ 6\ ;\ 10\ ;\ 14\ ;\ \ldots\ 82$ (2^{nd} factor in the bracket is 1 more than 1^{st} factor) $\therefore T_n=4n-3+1$ $\therefore T_n=4n-2$ $\therefore (1\times2)+(5\times6)+(9\times10)+(13\times14)+\ldots+(81\times82)$ $=\sum_{n=1}^{21}(4n-3)(4n-2)$ $=\sum_{n=1}^{21}(16n^2-20n+6)$ **NOTE**: Accept answer mark either as a quadratic equation or in factors form.	✓ $T_n=4n-3$ ✓ $n=21$ ✓ $T_n=4n-2$ ✓ answer	(4)

3.3	$a+ar+ar^2+...=1\cdots\cdots(1)$ $a^2+a^2r^2+a^2r^4+...=\frac{5}{6}\cdots\cdots(2)$ $S_\infty=\frac{a}{1-r}=1$ $\therefore a=1-r\cdots\cdots(3)$ $S_\infty=\frac{a^2}{1-r^2}=\frac{5}{6}$ $\therefore 6a^2=5-5r^2\cdots\cdots(4)$ (3) in (4) $\therefore 6(1-r)^2=5-5r^2$ $6(1-2r+r^2)=5-5r^2$ $6-12r+6r^2=5-5r^2$ $\therefore 11r^2-12r+1=0$ $(11r-1)(r-1)=0$ $\therefore r=\frac{1}{11}$ or $r=1(NA);\ (-1<r<1)$ $\therefore r=\frac{1}{11}$	✓ a as subject ✓ $6a^2=5-5r^2$ ✓ substitution ✓ standard form ✓ answers with rejection	(5)
			[16]

QUESTION 4

4.1	$p=2$ $q=-1$ **NOTE:** Do NOT accept answers in terms of x and y.	✓ answer ✓ answer	(2)
4.2	$f(x)=\frac{a}{x+p}+q$ $-\frac{5}{2}=\frac{a}{-4+2}-1$ $a=3$ **NOTE:** Answer only, full marks.	✓ answer	(1)
4.3	$y\in\Re\ ;\ y\neq-1$ **NOTE:** Both conditions must be stated.	✓ answer	(1)
4.4	$m=-1$ $y-(-1)=-1(x-(-2))$ $y+1=-x-2$ $y=-x-3$	✓ $m=-1$ ✓ substitution ✓ answer	(3)
4.5	$f\left(x+4\frac{1}{2}\right)$ moves $4\frac{1}{2}$ units to the left. $x=-6\frac{1}{2}$ $y=-1$ **NOTE**: Answers only, full marks.	✓ x-asymptote ✓ y- asymtote	(2)
			[9]

QUESTION 5

<table>
<tr><td>5.1</td><td>$0 = 2x^2 - x - 15$
$\therefore 0 = 4x - 1$
$\therefore x = \frac{1}{4}$
$\therefore f\left(\frac{1}{4}\right) = -\frac{121}{8}$
$\left(\frac{1}{4}\ ;\ -\frac{121}{8}\right)$

OR

$0 = 2x^2 - x - 15$
$\therefore x = -\frac{(-1)}{2(2)}$
$\therefore x = \frac{1}{4}$
$\therefore f\left(\frac{1}{4}\right) = -\frac{121}{8}$</td><td>✓ x-value
✓ y-value

OR

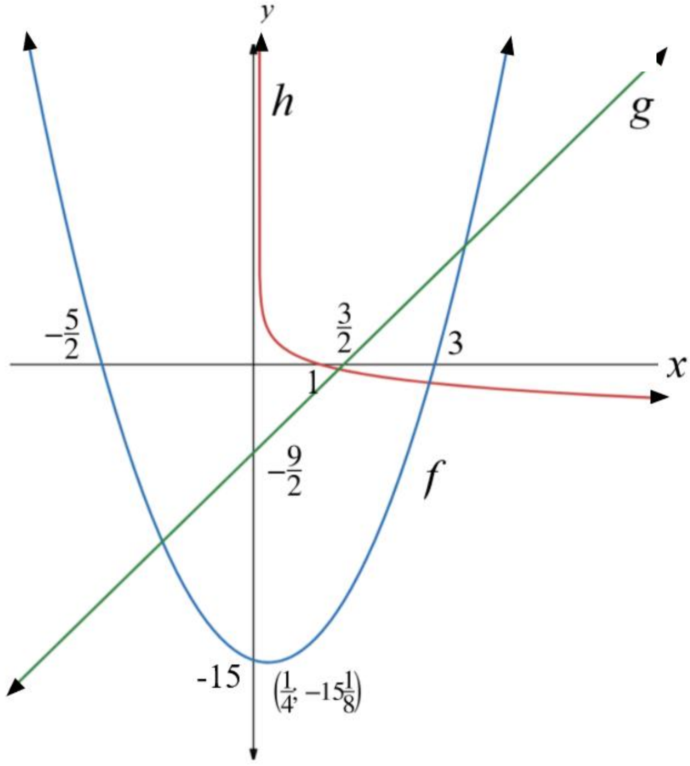
✓ x-value
✓ y-value</td><td>(2)</td></tr>
<tr><td>5.2</td><td>$f(x) = 2x^2 - x - 15$
$\therefore 0 = 2x^2 - x - 15$
$\therefore 0 = (2x + 5)(x - 3)$
$\therefore x = -\frac{5}{2}$ or $x = 3$

OR

$\therefore 0 = 2x^2 - x - 15$
$\therefore x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-15)}}{2(2)}$
$\therefore x = -\frac{5}{2}$ or $x = 3$</td><td>✓ factors = 0

OR

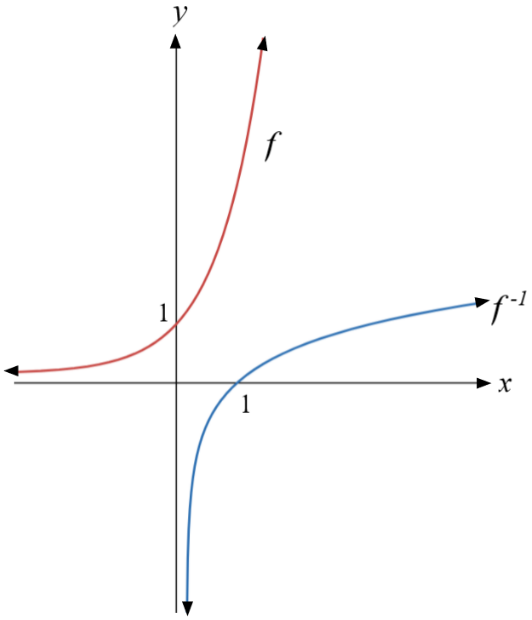
✓ substitution into quadratic formula</td><td>(1)</td></tr>
</table>

5.3	 **NOTE:** Candidates must not be penalised if the functions are sketched on 3 different axes.	✓ f : x and y intercepts ✓ f : shape ✓ g: y-intercept and positive gradient ✓ h : shape ✓ h : asymptote	(5)

5.4	$HR = f(x) - g(x)$ $HR = 2x^2 - x - 15 - 3x + 4\frac{1}{2}$ $HR = 2x^2 - 4x - 10\frac{1}{2}$ *but* $(x = 4)$ $\therefore HR = 2(4)^2 - 4(4) - 10\frac{1}{2}$ $HR = 5\frac{1}{2}\,units$ **OR** $f(4) = 2(4)^2 - 4 - 15$ $\therefore f(4) = 13$ $g(4) = 3(4) - 4\frac{1}{2}$ $\therefore g(4) = 7\frac{1}{2}$ $g(4) = 13 - 7\frac{1}{2}$ $HR = 5\frac{1}{2}\,units$ **NOTE:** Accept $g(x) - f(x)$ however candidate must present answer as a POSTIVE value for HR.	✓ method ✓ substitution ✓ answer **OR** ✓ calculate $f(4)$ and $g(4)$ ✓ $f(4) - g(4)$ ✓ answer	(3)
5.5.1	$x \in \Re$	✓ answer	(1)
5.5.2	$y \in \Re;\quad y > 0$ **NOTE**: No penalty for not stating $y \in \Re$.	✓ answer	(1)
5.6	$k = \frac{1}{8}$ For equal roots the graph shifts $15\frac{1}{8}$ units upwards and the y-intercept will be $15\frac{1}{8}$ units above where it is now. **OR**	✓✓ value of k **OR**	

	$2x^2 - x + k = 0$ For equal roots, $\Delta = 0$ $b^2 - 4ac = 0$ $\therefore (-1)^2 - 4(2)(k) = 0$ $\therefore 1 = 8k$ $\therefore k = \frac{1}{8}$	✓ condition for equal roots ✓ value of k	(2)
5.7	$g(x) - f(x)$ $= 3x - 4\frac{1}{2} - 2x^2 + x + 15$ $= -2x^2 + 4x + 10\frac{1}{2}$ $\therefore \frac{-\Delta}{4a}$ $= \frac{-\left[4^2 + 8\left(10\frac{1}{2}\right)\right]}{-8}$ $\therefore Max = 12\frac{1}{2} units$ **OR** $g(x) - f(x)$ $= 3x - 4\frac{1}{2} - 2x^2 + x + 15$ $= -2x^2 + 4x + 10\frac{1}{2}$ $\therefore -4x + 4 = 0$ $\therefore x = 1$ max value = $12\frac{1}{2} units$ **NOTE**: Any valid method.	✓ method ✓ substitution ✓ answer **OR** ✓ method ✓ derivative ✓ answer	(3)
			[18]

QUESTION 6

6.1	$f(x)=3^x$ $\therefore f^{-1}=\log_3 x$	✓ answer	(1)
6.2		✓ shape of f ✓ y-intercept of f ✓ shape of f^{-1} ✓ x-intercept of f^{-1}	(4)
6.3	$y=x$	✓ answer	(1)
6.4	$0<x\leq 1$ **NOTE**: Accept answer as separate inequalities.	✓ answer	(1)
6.5	$y>-4$	✓ answer	(1)
6.6	$g(x)=-f(x-2)$ $\therefore g(x)=-3^{x-2}$ **NOTE:** Answer only, FULL marks	✓ $g(x)=-f(x-2)$ ✓ answer	(2)
			[10]

QUESTION 7

7.1.1	$A = P(1-i)^n$ $\therefore A = 120\,000(1-0{,}09)^5$ $\therefore A = \text{R}74883{,}86$ **NOTE**: Answer only with correct formula, full marks.	✓ substitute correctly into correct formula ✓ answer	(2)
7.1.2	$A = P(1+i)^n$ $\therefore A = 120\,000(1+0{,}07)^5$ $\therefore A = \text{R}168\,306{,}21$ **NOTE**: Answer only with correct formula, full marks.	✓ substitute correctly into correct formula ✓ answer	(2)
7.1.3	**NOTE**: From Q7.1.1 and Q7.1.2, the (estimated) value of the sinking fund: $\text{R}168\,306{,}21 - \text{R}74\,883{,}86 = \text{R}93\,422{,}35$ [So R90 000 is close to this value] $F_v = \frac{x[(1+i)^{n+1}-1]}{i} = 90000$ $\therefore \frac{x[(1+\frac{0{,}085}{12})^{61}-1]}{\frac{0{,}085}{12}} = 90\,000$ $\therefore x = \text{R}1\,184{,}68$	✓ value of i and n ✓ substitute correctly into correct formula ✓ answer	(3)

7.2	$P_v = \frac{x[1-(1+i)^{-n}]}{i} = 900000$ $\therefore \frac{18000\left[1-\left(1+\frac{0,105}{12}\right)^{-n}\right]}{\frac{0,105}{12}} = 900000$ $\therefore \frac{\left[1-\left(1+\frac{0,105}{12}\right)^{-n}\right]}{\frac{0,105}{12}} = 50$ $\therefore 1-\left(1+\frac{0,105}{12}\right)^{-n} = \frac{7}{16}$ $\therefore 1-\frac{7}{16} = \left(1+\frac{0,105}{12}\right)^{-n}$ $\therefore \frac{9}{16} = \left(1+\frac{0,105}{12}\right)^{-n}$ $\therefore \left(1+\frac{0,105}{12}\right)^{n} = \frac{16}{9}$ $\therefore n\log\left(1+\frac{0,105}{12}\right) = \log\frac{16}{9}$ $\therefore n = 66,043$ **NOTE**: Accept 66 or 67 months	✓ substitute correctly into correct formula ✓ value of i and n ✓ simplification ✓ correct use of logs ✓ answer	(5)
			[12]

QUESTION 8

8.1.1	$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim_{h\to 0}\frac{-2(x+h)^2+1-(-2x^2+1)}{h}$ $=\lim_{h\to 0}\frac{-2(x^2+2xh+h^2)+1+2x^2-1}{h}$ $=\lim_{h\to 0}\frac{-2x^2-4xh-2h^2+1+2x^2-1}{h}$ $=\lim_{h\to 0}\frac{-4xh-2h^2}{h}$ $=\lim_{h\to 0}\frac{h(-4x-2h)}{h}$ $=\lim_{h\to 0}(-4x-2h)$ $=-4x$ **NOTE**: Penalise for notation error in this question only.	✓ substitution ✓ simplification ✓ $=\lim_{h\to 0}\frac{-4xh-2h^2}{h}$ ✓ answer	(4)
8.1.2	$f'\left(\frac{-1}{2}\right)=-4\left(-\frac{1}{2}\right)$ $\therefore f'\left(\frac{-1}{2}\right)=2$ **NOTE**: Answer only, full marks.	✓ answer	(1)
8.2	$f(x)=\sqrt[3]{x^2}+\frac{1}{4x^4}$ $\therefore f(x)=x^{\frac{2}{3}}+\frac{1}{4}x^{-4}$ $f'(x)=\frac{2}{3}x^{-\frac{1}{3}}-1x^{-5}$	✓ write as exponents ✓✓ answers	(3)

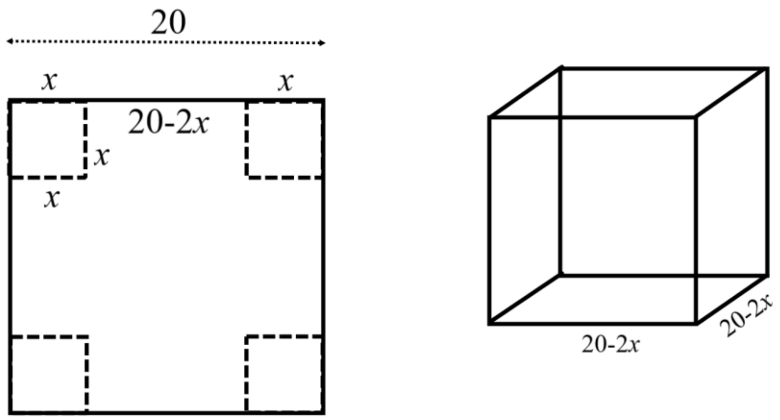
8.3	$h(x)=ax^2 \cdots\cdots a>0$ $\therefore h'(x)=2ax$ $h'(4)=2a(4)$ $\therefore h'(4)=8a$ inverse: $x=ay^2 \quad ; \quad y>0$ $\therefore y^2=\frac{x}{a} \quad ; \quad y>0$ $\therefore y=+\sqrt{\frac{x}{a}}$ $\therefore h^{-1}(x)=\sqrt{\frac{x}{a}}$ $\therefore h^{-1}(8)=\sqrt{\frac{8}{a}}$ $\therefore h^{-1}(8)=h'(4)$ $\therefore \sqrt{\frac{8}{a}}=8a$ $\left(\sqrt{\frac{8}{a}}\right)^2=(8a)^2$ $\frac{8}{a}=64a^2$ $\therefore 8=64a^3$ $\therefore \frac{8}{64}=a^3$ $\therefore a^3=\frac{1}{8}$ $\therefore a=\sqrt[3]{\frac{1}{8}}$ $\therefore a=\frac{1}{2}$	✓ $h'(x)=2ax$ ✓ $h'(4)=8a$ ✓ $h^{-1}(8)=\sqrt{\frac{8}{a}}$ ✓ $\sqrt{\frac{8}{a}}=8a$ ✓ value of a	(5)
			[13]

QUESTION 9

9.1	$y=-2(x-1)^2(x-4)$ $=-2(x^2-2x+1)(x-4)$ $=-2(x^3-2x^2+x-4x^2+8x-4)$ $=-2(x^3-6x^2+9x-4)$ $\therefore y=-2x^3-12x^2-18x+8$ $\therefore a=12$ $\therefore b=-18$ $\therefore c=8$	✓ method ✓ $-2(x^2-2x+1)(x-4)$ ✓ $-2(x^3-6x^2+9x-4)$	(3)
9.2	$f(x)=-2x^3+12x^2-18x+8$ $\therefore f'(x)=-6x^2+24x-18$ $\therefore f'(x)=x^2-4x+3$ $\therefore 0=x^2-4x+3$ $0=(x-3)(x-1)$ $\therefore x=1$ or $x=3$ but $f(3)=8$ $\therefore$ tangent passes through points C and D. **NOTE:** Does not have to conclude that the tangent passes through points C and D. Can conclude at $f(3)=8$. If a candidate calculates the tangent at point D and proves that the tangent does NOT pass through point C, award full marks.	✓ $f'(x)$ ✓ x-values ✓ $f(3)=8$	(3)
9.3	$f'(x)=-6x^2+24x-18$ $f''(x)=-12x+24$ $0=-12x+24$ $x=2$ $f(2)=4$ $\therefore \perp h=4$ $Area=\frac{1}{2}(3)(4)$ $Area=6\ units^2$	✓ $f''(x)=0$ ✓ value for x ✓ $f(2)=4$ ✓ answer	(4)
9.4	$f''(x)<0$ $\therefore -12x+24<0$ $\therefore x>2$ **NOTE**: Valid from Q9.3. Answer only, full marks.	✓ answer	(1)
9.5	$1<x<3$	✓ answer	(1)

9.6	turning points: $(x\ ;\ y-3)$ $(1\ ;\ -3)$ and $(3\ ;\ 5)$	✓✓ answers	(2)
			[14]

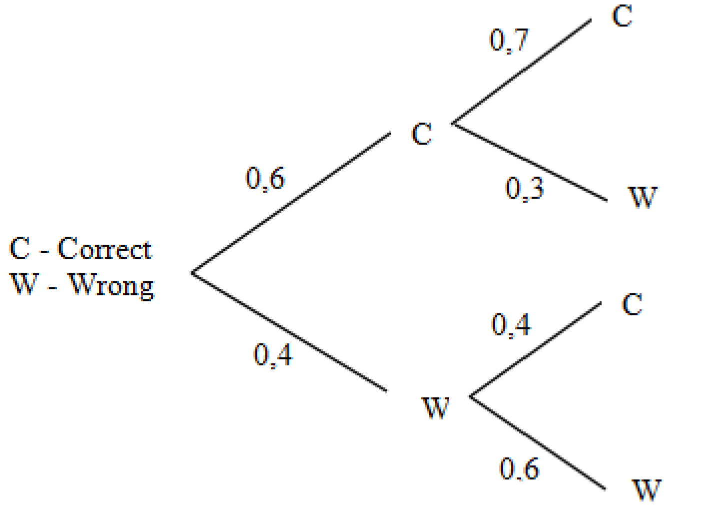
QUESTION 10



$V(x)=x(20-2x)(20-2x)$ $\therefore V(x)=400x-80x^2+4x^3$ $V'(x)=400-160x+12x^2$ $\therefore 0=400-160x+12x^2$ $0=4(100-40x+3x^2)$ $0=4(3x-10)(x-10)$ $\therefore x=\frac{10}{3}$ or $x=10$ $V''(x)=-160+24x$ $\therefore V''\left(\frac{10}{3}\right)=-160+80<0$ $\therefore V''(10)=-160+240>0$ By the 2^{nd} derivative test, the dimensions would be: $\frac{10}{3}cm$ by $\frac{40}{3}cm$ by $\frac{40}{3}cm$ **NOTE:** $V'(x)=0$ must be stated and not implied. Accept valid methods indicating that $x=\frac{10}{3}$ at the maximum and $x\neq 10$.	✓ $V(x)=x(20-2x)(20-2x)$ ✓ $V(x)=400x-80x^2+4x^3$ ✓ $0=400-160x+12x^2$ ✓ x-values ✓ $V''(x)=-160+24x$ ✓ $V''\left(\frac{10}{3}\right)<0$ and $V''(10)>0$ ✓ dimensions	(7)
		[7]

QUESTION 11

11.1.1	$P(A)=\frac{2}{6}=\frac{1}{3}$ $P(B)=\frac{3}{6}=\frac{1}{2}$	✓ answer $P(A)$ ✓ answer $P(B)$	(2)
11.1.2	$P(A')=1-P(A)$ $\therefore P(A')=1-\frac{1}{3}$ $\therefore P(A')=\frac{2}{3}$	✓ answer	(1)
11.1.3	$A=\{1\ ;\ 2\}$ $B=\{2\ ;\ 4\ ;\ 6\}$ $C=\{6\}$ NO. $P(A$, B and $C)\neq 0$ **NOTE:** The first mark can only be awarded if a reason is provided. Not awarding marks for yes/ no answers only.	✓ NO. ✓ valid explanation	(2)
11.1.4	$P(A \text{ or } C)=P(A)+P(C)-P(A \text{ and } C)$ $\therefore P(A \text{ or } C)=\frac{1}{3}+\frac{1}{6}-0$ $\therefore P(A \text{ or } C)=\frac{1}{2}$ **OR** $P(A \text{ or } C)=\frac{n(A \text{ or } C)}{n(S)}$ $P(A \text{ or } C)=\frac{3}{6}$ $\therefore P(A \text{ or } C)=\frac{1}{2}$ **NOTE**: Answer only, full marks.	✓ $P(A\cup C)=\frac{1}{3}+\frac{1}{6}-0$ ✓ Answer **OR** ✓ substitution ✓ answer	(2)

11.1.5	$P(B)\times P(C)$ $=\frac{1}{2}\times\frac{1}{6}$ $=\frac{1}{12}$ $but\cdots P(B\cap C)=\frac{1}{6}$ $\therefore P(B\cap C)\neq P(B)\times P(C)$ $\therefore$ B and C are not independent events.	✓ $P(B)\times P(C)=\frac{1}{12}$ ✓ $P(B\cap C)\neq P(B)\times P(C)$ ✓ conclusion	(3)
11.2	 $P(2^{nd}\cdots ans\cdots corr)=0,6\times0,7+0,4\times0,4$ $=0,42+0,16$ $=0,58$	✓ correct 1^{st} and 2^{nd} branches ✓ $=0,6\times0,7+0,4\times0,4$ ✓ answer	(3)
11.3	**NOTE:** This question is removed from the question paper.		
			[13]

TOTAL: 147

END