Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE 12/*GRAAD 12*

JUNE/*JUNIE* 2025

MATHEMATICS P1 MARKING GUIDELINE/ *WISKUNDE V1 NASIENRIGLYN*

MARKS/*PUNTE*: **150**

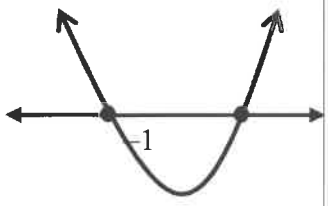
This marking guideline consists of 18 pages./
Hierdie nasienriglyn bestaan uit 18 bladsye.

NOTE/*LET WEL*:

- If a candidate answers a question TWICE, mark the FIRST attempt ONLY.
  Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk SLEGS die EERSTE poging.
- Consistent accuracy applies in ALL aspects of the marking guideline.
  Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die nasienriglyn.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
  Indien 'n kandidaat 'n poging vir 'n vraag deurgetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deurgetrek is.
- The mark for substitution is awarded for substitution into the correct formula.
  Die punt vir substitusie word vir substitusie in die korrekte formule toegeken.

QUESTION/*VRAAG 1*

1.1.1	$x^2+2x+1=0$ $(x+1)(x+1)=0$ $x+1=0$ or/*of* $x+1=0$ $x=-1$ or/*of* $x=-1$ **OR/*OF*** $x^2+2x+1=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(2)\pm\sqrt{(2)^2-4(1)(1)}}{2(1)}$ $=\frac{-2\pm\sqrt{0}}{2}$ $x=-1$ or / *of* $x=-1$ Answers only – Full Marks *Slegs antwoorde – Volpunte*	✓ factors / *faktore* ✓ both answers / *beide antwoorde* **OR/*OF*** ✓ correct substitution into correct formula / *korrekte vervanging in korrekte formule* ✓ both answers / *beide antwoorde* (2)
1.1.2	$x(5x-3)=1$ $5x^2-3x-1=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-(-3)\pm\sqrt{(-3)^2-4(5)(-1)}}{2(5)}$ $x=\frac{3\pm\sqrt{29}}{10}$ $\therefore x=-0,24$ or / *of* $x=0,84$ Penalise 1 mark for incorrect rounding off./ *Penaliseer 1 punt vir verkeerde afronding.*	✓ standard form / *standaardvorm* ✓ substitution / *vervanging* ✓✓ *x*-values / *x-waardes* (4)

1.1.3	$2x+3>x^2$ $-x^2+2x+3>0$ $x^2-2x-3<0$ critical values/*kritieke waardes* $(x+1)(x-3)=0$ $x=-1$ or/*of* $x=3$   3 $-1<x<3,\ x\in\mathbf{R}$ **OR/*OF*** $x\in(-1\ ;\ 3),\ x\in\mathbf{R}$	✓ standard form / *standaardvorm* ✓ critical values / *kritieke waardes* ✓✓ $-1<x<3,\ x\in\mathbf{R}$ (accuracy / *akkuraatheid*) **OR/*OF*** $x\in(-1\ ;\ 3),\ x\in\mathbf{R}$ (4)
1.1.4	$\sqrt{7x-12}-x=0$ $\sqrt{7x-12}=x$ $\left(\sqrt{7x-12}\right)^2=(x)^2$ $7x-12=x^2$ $x^2-7x+12=0$ $(x-3)(x-4)=0$ $\therefore\ x=3$ or / *of* $x=4$	✓ isolating surd / *isoleer wortelvorm* ✓ square both sides / *kwadreer beide kante* ✓ standard form / *standaardvorm* ✓ both answers / *beide antwoorde* (4)
1.1.5	$\left(\frac{1}{6}\right)^{3x+2}.216^{3x}=\frac{1}{216}$ $6^{-3x-2}\times6^{9x}=6^{-3}$ $\therefore\ 6x-2=-3$ $6x=-1$ $x=-\frac{1}{6}$	✓ same base / *dieselfde basis* ✓ exponential law / *eksponentwet* ✓ equating exponents / *gelykstel van eksponente* ✓ answer / *antwoord* (4)

1.2	$x+y=3$.....(1) $x^2+2y^2=18$.....(2) From/*Vanaf*(1): $y=-x+3$.....(3) (3)into/*in*(2): $x^2+2(-x+3)^2=18$ $x^2+2(x^2-6x+9)-18=0$ $x^2+2x^2-12x+18-18=0$ $3x^2-12x=0$ $3x(x-4)=0$ $3x=0$ or/*of* $x-4=0$ $x=0$ or/*of* $x=4$ $y=3$ or/*of* $y=-1$	✓ $y=-x+3$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ x-values / *waardes* ✓ y-values / *waardes* (5)
1.3	$\left(\sqrt{5}\right)^x-\left(\sqrt[3]{2}\right)^y=17$ $(5)^{\frac{1}{2}x}-(2)^{\frac{1}{3}y}=25-8$ $(5)^{\frac{1}{2}x}-(2)^{\frac{1}{3}y}=5^2-2^3$ $\therefore \frac{1}{2}x=2$ and/*en* $\frac{1}{3}y=3$ $\Rightarrow x=4$ and/*en* $y=9$ $P=(4\times9)=36$	✓ converting to exponential form / *herlei na eksponensiale vorm* ✓ $17=25-8$ ✓ equating exponents / *gelykstel van eksponente* ✓ answer / *antwoord* (4)
		[27]

QUESTION/*VRAAG 2*

2.1.1	Yes / *Ja* ; $-1<\frac{1}{2}<1$	✓ Yes / *Ja* ✓ reason / *rede* (2)
2.1.2	$S_\infty = \frac{a}{1-r}$ $= \frac{36}{1-\frac{1}{2}}$ $= 72\ \text{cm}^2$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
2.1.3	Side length series / *Sylengte reeks*: $6 + 3\sqrt{2} + 3\ ; \ldots \Rightarrow r = \frac{1}{2}$ $T_n = 6\left(\frac{1}{\sqrt{2}}\right)^{n-1} = \frac{3}{8}$ $\left(\frac{1}{\sqrt{2}}\right)^{n-1} = \left(\frac{1}{16}\right)$ $\left(\frac{1}{2}\right)^{n-1} = \left(\frac{1}{256}\right)$ $\left(\frac{1}{\sqrt{2}}\right)^{n-1} = \left(\frac{1}{\sqrt{2}}\right)^8$ *OR / OF* $\left(\frac{1}{2}\right)^{n-1} = \left(\frac{1}{2}\right)^8$ $\therefore\ n-1=8$ $n=9$ **OR/*OF*** Area series / *Oppervlakte reeks* side length / *sylengte* $= \frac{3}{8} \Rightarrow$ Area / *Oppervlakte* $= \frac{9}{64}$ $T_n = 36\left(\frac{1}{2}\right)^{n-1} = \frac{9}{64}$ $\left(\frac{1}{2}\right)^{n-1} = \left(\frac{1}{256}\right)$ $\left(\frac{1}{2}\right)^{n-1} = \left(\frac{1}{2}\right)^8$ $\therefore\ n-1=8$ $n=9$	✓ new series / *nuwe reeks* ✓ substitution / *vervanging* ✓ answer / *antwoord* **OR/*OF*** ✓ Area / *Oppervlakte* $= \frac{9}{64}$ ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)

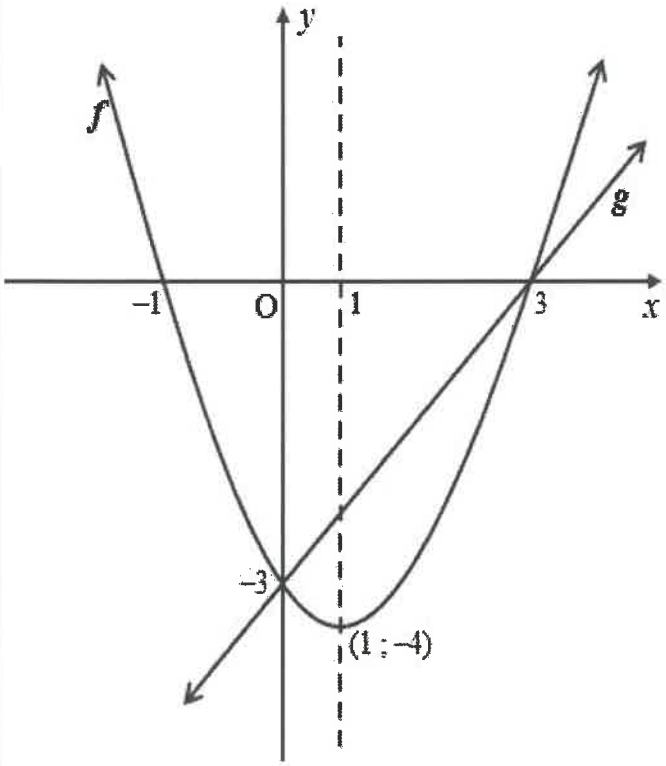
2.1.4	Series of ONE diagonal / *Reeks van EEN hoeklyn*: $6\sqrt{2} + 6 + 3\sqrt{2} + 3 + \ldots$ $\Rightarrow r = \frac{1}{\sqrt{2}}$ $S_n = \frac{a\left(1-r^n\right)}{1-r}$ $= \frac{6\sqrt{2}\left(1-\left(\frac{1}{\sqrt{2}}\right)^{10}\right)}{1-\frac{1}{\sqrt{2}}}$ $= 28,07$ units / *eenhede* $\because$ there are two diagonals: $\because$ *daar twee hoeklyne is*: $\Rightarrow 2 \times 28,07 = 56,14$units / *eenhede* **OR/*OF*** Series of TWO diagonals / *Reeks van TWEE hoeklyne*: $12\sqrt{2} + 12 + 6\sqrt{2} + 6 + \ldots$ $\Rightarrow r = \frac{1}{\sqrt{2}}$ $S_n = \frac{a\left(1-r^n\right)}{1-r}$ $= \frac{12\sqrt{2}\left(1-\left(\frac{1}{\sqrt{2}}\right)^{10}\right)}{1-\frac{1}{\sqrt{2}}}$ $= 56,13$ units / *eenhede*	✓ diagonal series / *hoeklyn reeks* ✓ $r = \frac{1}{\sqrt{2}}$ ✓ substitution / *vervanging* ✓ answer / *antwoord* **OR/*OF*** ✓ diagonal series / *hoeklyn reeks* ✓ $r = \frac{1}{\sqrt{2}}$ ✓ substitution / *vervanging* ✓ answer / *antwoord* (4)

2.2.1	$a+11d=14$ .....(1) $a+6d=4$ .....(2) $5d=10$ $d=2$ $a+6(2)=4$ $a=-8$	✓ both equations / *beide vergelykings* ✓ value of d / *waarde van d* ✓ value of a / *waarde van a* (3)
2.2.2	$T_n=-8+(n-1)(2)$ $=2n-10$ $2n-10=8$ $2n=18$ $n=9$ $T_9=8$, is the additive inverse of first term *is die optellingsinverse van die eerste term*	✓ Equating $T_n=8$ / *Stel* $T_n=8$ ✓ answer / *antwoord* (2)
2.3	$T_1=3\ ;\ T_2=7\ ;\ T_3=11 \Rightarrow d=4$ $T_{100}=399$ $S_n=\frac{n}{2}(a+l)$ $19995=\frac{101-k}{2}[(4k-1)+399]$ $39990=(101-k)(4k+398)$ $4k^2-6k-208=0$ $2k^2-3k-104=0$ $k=8 \quad or \quad k\neq-\frac{13}{2}$	✓ $T_1=4k-1$ & $T_{100}=399$ ✓ $n=101-k$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ answer / *antwoord* (5)
		[21]

QUESTION/*VRAAG 3*

3.1.1	**3 ; 12 ; 33 ; 66 ; T_5** **9 ; 21 ; 33 ; 45** **12 ; 12 ; 12** $T_5 = 111$	✓ 2nd difference / 2de *verskil* ✓ answer / *antwoord* (2)
3.1.2	$T_9 = 6(9)^2 - 9(9) + 6$ $= 411$ $T_9 - T_5 = 411 - 111$ $= 300$	✓ value of T_9 / *waarde van* T_9 ✓ answer / *antwoord* (2)
3.2	$T_n = an^2 + bn + 1$ $T_4 = 27 \Rightarrow 16a + 4b + 1 = 27$ $T_3 - T_2 = 8 \Rightarrow 5a + b = 8$ $20a + 4b = 32$ $16a + 4b = 26$ $4a = 6$ $a = \frac{3}{2}$ $5\left(\frac{6}{4}\right) + b = 8$ $b = 8 - \frac{15}{2}$ $b = \frac{1}{2}$	✓ $16a + 4b + 1 = 27$ ✓ $5a + b = 8$ ✓ method of solving / (elimination or substitution) *metode om op te los (eliminasie of vervanging)* ✓ value of a / *waarde van a* ✓ value of b / *waarde van b* (5)
		[9]

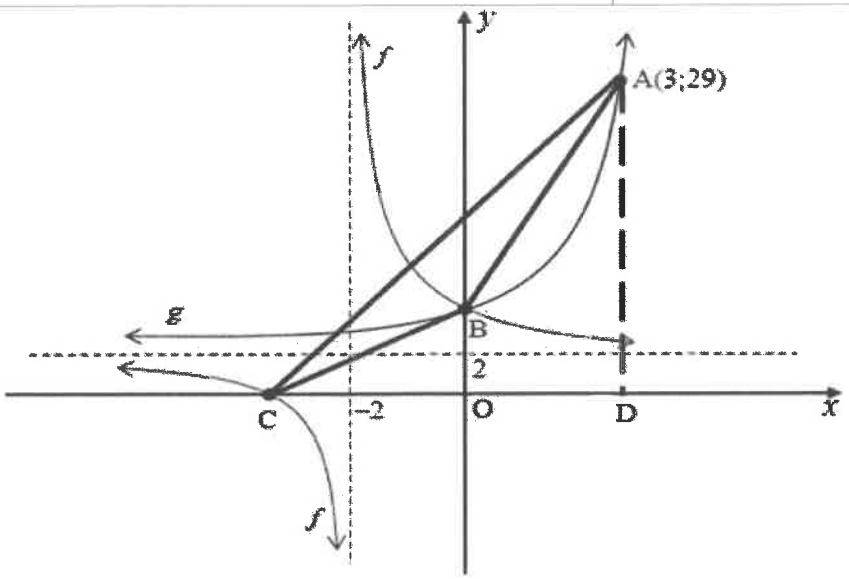
QUESTION/*VRAAG 4*

4.1.1	$f(x)=x^2-2x-3$ $y-\text{int}(x=0):\ y=-3$ $x-\text{int}(y=0):\ x^2-2x-3=0$ $x=3\ \ or\ \ x=-1$ $x=-\frac{b}{2a}=\frac{-(-2)}{2(1)}=1$ $y=(1)^2-2(1)-3=-4\ \Rightarrow\ TP\ is\ (1;-4)$ $g(x)=x-3$ $x-\text{int}(y=0):\ y=-3$ $y-\text{int}(x=0):\ x=3$  	**Marks are awarded on sketch NOT for working** ***Punte word op skets toegeken NIE vir bewerkings NIE*** Graph of $f(x)$ / *Grafiek van* $f(x)$ ✓ *x*-intercepts / *x-afsnitte* ✓ *y*-intercept / *y-afsnit* ✓ turning point / *draaipunt* ✓ shape / *vorm* Graph of $g(x)$ / *Grafiek van* $g(x)$ ✓ *x*-intercept / *x-afsnit* ✓ *y*-intercept / *y-afsnit* (6)
4.1.2 (a)	$x<0\ \ or\ /\ of\ \ x>3$	✓ $x<0$ and/*en* ✓ $x>3$ (2)
4.1.2 (b)	$x\leq -1$ or $x=3$	✓✓ answer / *antwoord* (2)
4.1.3	Range of h / *Waardeversameling (Terrein) van* h : $y\leq 0; y\in\mathbb{R}$	✓✓ answer / *antwoord* (2)

4.2	$-x+1=4$ $-x=3$ $x=-3 \quad \Rightarrow \quad A(-3;0)$	✓ A(–3;0)
	$y=a(x+p)^2+q$ $y=a(x-1)^2+8$ $0=a(-3-1)^2+8$ $-8=16a$ $-\frac{1}{2}=a$	✓ substitution of T/P and A / *vervanging van T/P en A* ✓ $a=-\frac{1}{2}$
	$\Rightarrow p(x)=-\frac{1}{2}(x-1)^2+8$	✓ answer / *antwoord* (4)
		[16]

QUESTION/*VRAAG 5*

5.1	B(0 ; 3)	✓ answer / *antwoord* (1)
5.2	Range of / *Waardeversameling van* g: $y > 2; y \in \mathbb{R}$	✓ answer / *antwoord* (1)
5.3	$g(x) = b^x + 2$ $29 = b^3 + 2$ $3^3 = b^3$ $\therefore\ b = 3$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
5.4	$\frac{2}{x+2} + 2 = 0$ $2 + 2x + 4 = 0$ $2x = -6$ $x = -3$ $\therefore\ C(-3;0)$	✓ equating to 0 / *gelyk stel aan* 0 ✓ answer / *antwoord* (2)
5.5	$h(x) = 3^x + 2 - 2$ $= 3^x$ $h^{-1}(x):\ x = 3^y$ $\therefore\ y = \log_3 x$	✓ $h(x) = 3^x$ ✓ swopping x and y / *omruil van x en y* ✓ answer / *antwoord* (3)
5.6	original axis of symmetry: *oorspronklikesimmetrie-as* $\boldsymbol{y = x}$ $\therefore\ \boldsymbol{y = (x + 2) + 2}$ $\boldsymbol{y = x + 4}$	✓ method / *metode* ✓ answer / *antwoord* (2)

5.7	$-3 \leq x < -2$	✓✓ answer / *antwoord*	(2)
			
	$Area\ of\ \Delta ACD = \frac{1}{2}(6)(29) = 87\ units^2 / eenhede^2$ $Area\ of\ \Delta BCO = \frac{1}{2}(3)(3) = 4,5\ units^2 / eenhede^2$ $Area\ of\ Trap.BODA = \left(\frac{3+29}{2}\right)\times 3 = 48\ units^2 / eenhede^2$ $\therefore Area\ \Delta ABC = 87 - (4,5+48) = 34,5\ units^2 / eenhede^2$ **NOTE: There are many different alternative solutions to this question. Follow learner's solution and award marks accordingly.** ***LET WEL: Daar is baie verskillende alternatiewe oplossings vir hierdie vraag. Volg leerder se oplossing en ken punte dienooreenkomstig toe.***	✓ Area of Δ ACD / *oppervlakte van* Δ ACD ✓ Area of Δ BCO / *oppervlakte van* Δ BCO ✓ Area of Trapezium BODA / *Oppervlakte van Trapezium* BODA ✓ Area of Δ ABC / *oppervlakte van* Δ ABC	(4)
			[17]

QUESTION/*VRAAG 6*

6.1.1	$1+i_{eff}=\left(1+\frac{i_{nom}}{m}\right)^{m}$ $=\left(1+\frac{6,5\%}{12}\right)^{12}$ $i_{eff}=\left(1+\frac{6,5\%}{12}\right)^{12}-1$ $=0,066971852...$ effective rate / *effektiewe koers* $=6,6972\%$ *p.a.*	✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (3)
6.1.2	$A=P(1+i)^{n}$ $=500\,000(1+6,6972\%)^{5}$ $=R691\,409,14$ **OR/*OF*** $A=P(1+i)^{n}$ $=500\,000\left(1+\frac{6,5\%}{12}\right)^{60}$ $=R691\,408,66$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2) **OR/*OF*** ✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
6.2	$A=P(1-i)^{n}$ $250\,000=800\,000(1-20,75\%)^{n}$ $\frac{5}{16}=\left(\frac{317}{400}\right)^{n}$ $\therefore\ n=\log_{\frac{317}{400}}\left(\frac{5}{16}\right)$ $n=5$ years / *jaar*	✓ substitution / *vervanging* ✓ simplification (correct use of Logs) / *vereenvoudiging (korrekte gebruik van Logs)* ✓ answer / *antwoord* (3)

6.3	$A_1 = 650197\left(1+\frac{6{,}1\%}{12}\right)^{60} = R881392{,}29$ $A_2 = P(1+i)^n$ $2\,000\,000 = (881392{,}29+x)\left[1+\frac{7{,}47\%}{4}\right]^{20}$ $881392{,}29+x = 138292{,}32$ $x = R500\,000{,}00$	✓ substitution / *vervanging* ✓ answer / *antwoord* ✓ adding Rx / *by tel van Rx* ✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (6)
		[14]

QUESTION/*VRAAG 7*

		Penalise 1 mark for incorrect notation in 7.1 only ***Penaliseer 1 punt vir verkeerde notasie, slegs in 7.1***
7.1	$f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{(x+h)^2+(x+h)-(x^2+x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{x^2+2xh+h^2+x+h-x^2-x}{h}$ $=\lim\limits_{h\to 0}\dfrac{2xh+h^2+h}{h}$ $=\lim\limits_{h\to 0}\dfrac{h(2x+h+1)}{h}$ $=\lim\limits_{h\to 0}(2x+h+1)$ $=2x+1$ Answer ONLY: 0 marks *SLEGS antwoord*: 0 *punte*	✓ substitution / *vervanging* ✓ $x^2+2xh+h^2+x+h$ ✓ simplification / *vereenvoudiging* ✓ factorisation / *faktorisering* (dividing by h / *deel deur* h) ✓ answer / *antwoord* (5)
7.2.1	$f(x)=3x^4-\dfrac{1}{2}x^{-2}$ $f'(x)=12x^3+x^{-3}$ $=12x^3+\dfrac{1}{x^3}$	✓ $12x^3$ ✓ x^{-3} (2)
7.2.2	$D_x\left[\dfrac{x+4}{\sqrt{x}}\right]$ $=D_x\left[\dfrac{x}{x^{\frac{1}{2}}}+\dfrac{4}{x^{\frac{1}{2}}}\right]$ $=D_x\left[x^{\frac{1}{2}}+4x^{-\frac{1}{2}}\right]$ $=\dfrac{1}{2}x^{-\frac{1}{2}}-2x^{-\frac{3}{2}}$	✓ $x^{\frac{1}{2}}$ ✓ $4x^{-\frac{1}{2}}$ ✓ $\dfrac{1}{2}x^{-\frac{1}{2}}$ ✓ $-2x^{-\frac{3}{2}}$ (4)
		[11]

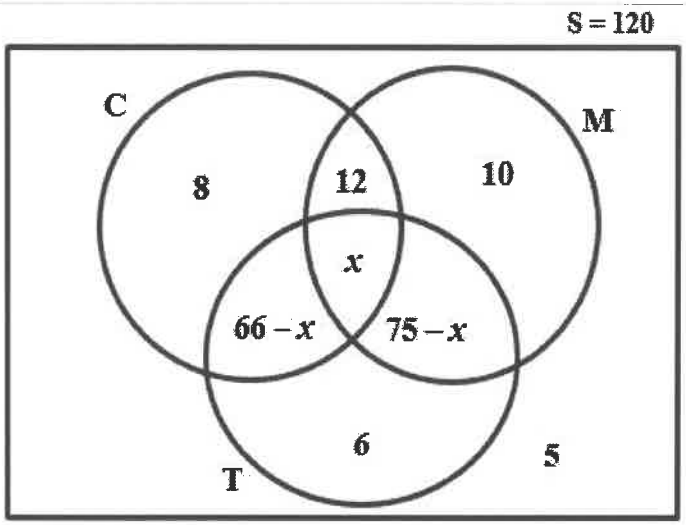
QUESTION/*VRAAG 8*

8.1	OA = 37 units/*eenhede*	✓ answer / *antwoord* (1)
8.2	$f(x)=2x^3-3x^2-cx+37$ $f(1)=2(1)^3-3(1)^2-c(1)+37=0$ $2-3-c+37=0$ $c=-36$	✓ substitution of 1 and equating to 0 / *vervanging van 1 en gelyk stel aan 0* ✓ answer / *antwoord* (2)
8.3	$f(x)=2x^3-3x^2-36x+37$ $f'(x)=6x^2-6x-36=0$ $x^2-x-6=0$ $(x+2)(x-3)=0$ $x=-2$ or / *of* $x=3$ $y=81$ or / *of* $y=-44$ $P(-2;81)$; $Q(3;-44)$	✓ $f'(x)$ ✓ $f'(x)=0$ ✓ x-values / *x-waardes* ✓ y-values / *y-waardes* (4)
8.4	$x\leq -2$ or / *of* $x\geq 3$	✓✓ answer / *antwoord* (2)
8.5	$k<-81$ or / *of* $k>44$	✓✓ answer / *antwoord* (2)
8.6	$f''(x)=12x-6$ $f''(1)=12(1)-6$ $=6>0$ $\Rightarrow f$ is concave up / *konkaaf op* **OR/*OF*** $f''(x)=12x-6=0$ $x=\frac{1}{2}(x-\text{coordinate of p.o.i})$ $(x-koördinaatvanbuigpunt)$ ∴since B lies to the right of the p.o.i and a is +*ve* *omdat B regs van buigpunt lê en a is +ve* $\Rightarrow f$ is concave up at point B / *f is konkaaf op by punt B*	✓ f'' ✓ answer / *antwoord* ✓ conclusion / *gevolgtrekking* (3) **OR/*OF*** ✓ f'' ✓ answer / *antwoord* ✓ conclusion / *gevolgtrekking* (3)
		[14]

QUESTION/*VRAAG 9*

9.1	$T.S.A = x^2 + 4xh$ $x^2 + 4xh = 300$ $h = \frac{300 - x^2}{4x}$ $Volume = x \times x \times h$ $= x^2 \times \left(\frac{300 - x^2}{4x}\right)$ $= 75x - \frac{1}{4}x^3$ Maximum Volume / *Maksimum Volume*: $V'(x) = 75 - \frac{3}{4}x^2 = 0$ $-\frac{3}{4}x^2 = -75$ $x^2 = 100$ $x = 10 \quad ; \quad \because x > 0$ $V = 75(10) - \frac{1}{4}(10)^3$ $= 750 - 250$ $= 500 \text{ units}^2$ / *eenhede*^{2}	✓ $x^2 + 4xh = 300$ ✓ h in terms of x / h *in terme van* x ✓ substitution / *vervanging* ✓ answer / *antwoord* ✓ $A'(x) = 0$ ✓ answer / *antwoord* ✓ answer / *Antwoord* (7)
		[7]

QUESTION 10/*VRAAG 10*

10.1.1	$P(A \text{ or / of } B) = P(A) + P(B)$ $0,52 = 0,4 + x$ $x = 0,12$	✓ substitution into correct formula / *vervanging in korrekte formule* ✓ answer / *antwoord* (2)
10.1.2	$P(A \text{ or / of } B) = P(A) + P(B) - P(A).P(B)$ $0,52 = 0,4 + x - 0,4x$ $0,6x = 0,12$ $x = 0,2$	✓ P(A and/*en* B) = P(A) x P(B) ✓ substitution into correct formula / *vervanging in korrekte formule* ✓ answer / *antwoord* (3)
10.2.1		✓ 5 ; 6 ; 8 ; 10 ✓ x ; $66 - x$; $75 - x$ ✓ 12 (3)
10.2.2	$8 + 12 + 10 + x + 66 - x + 75 - x + 6 + 5 = 120$ $182 - x = 120$ $x = 62$	✓ adding and equating / *optel en gelyk stel* ✓ answer / *antwoord* (2)
10.2.3	$P(C \text{ and / en } T) = \frac{66}{120}$	✓ answer / *antwoord* (1)
10.2.4	$P(\text{at least } 2 \text{ / ten minste } 2) = \frac{91}{120}$	✓ answer / *antwoord* (1)
10.2.5	$P(\text{not } C \text{ and not } T) = \frac{15}{120}$ $P(\text{nie } C \text{ en nie } T) = \frac{15}{120}$	✓✓ answer / *antwoord* (2)
		[14]

TOTAL/*TOTAAL:* 150

Gr 12 June Exam P1 2025 /150

1.1 1. $x^2 + 2x + 1 = 0$

$(x+1)(x+1) = 0$ ✓

$\therefore x = -1$ ✓ (2)

2. $x(5x-3) = 1$

$5x^2 - 3x - 1 = 0$ ✓

$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(5)(-1)}}{2(5)}$ ✓

$= \frac{3 \pm \sqrt{29}}{10}$

$= 0,84$ ✓ or $-0,24$ ✓ (4)

3. $2x + 3 > x^2$

$0 > x^2 - 2x - 3$ ✓

$0 > (x-3)(x+1)$

cv: $(x-3)(x+1) = 0$

$x = 3$ or -1 ✓

$-1 < x < 3$ ✓✓ 4

4. $\sqrt{7x-12} - x = 0$

$\sqrt{7x-12} = x$ ✓

$\left(\sqrt{7x-12}\right)^2 = (x)^2$

$7x - 12 = x^2$ ✓

$0 = x^2 - 7x + 12$ ✓

$= (x-3)(x-4)$

$\therefore x = 3$ or 4 ✓ (4)

1.1 5. $\left(\frac{1}{6}\right)^{3x+2} \cdot 216^{3x} = \frac{1}{216}$

$\frac{1}{6} = \frac{1}{3 \cdot 2} = 3^{-1} \cdot 2^{-1}$

$216 = 2^3 \, 3^3$

$(3^{-1} \cdot 2^{-1})^{3x+2} \cdot (2^3 3^3)^{3x}$ ✓ $= 2^{-3} \cdot 3^{-3}$

$3^{-3x-2} \cdot 2^{-3x-2} \cdot 2^{9x} \cdot 3^{9x}$ ✓ $= 2^{-3} \cdot 3^{-3}$

$2^{6x-2} \cdot 3^{6x-2} = 2^{-3} \cdot 3^{-3}$

$\therefore 6x - 2 = -3$ ✓

$x = -\frac{1}{6}$ ✓ (4)

12. $x + y = 3 \quad x^2 + 2y^2 = 18$

$x = 3 - y$ ✓

$(3-y)^2 + 2y^2 = 18$ ✓

$9 - 6y + y^2 + 2y^2 = 18$

$3y^2 - 6y - 9 = 0$

$\div 3: \; y^2 - 2y - 3 = 0$ ✓

$(y+1)(y-3) = 0$

$\therefore y = -1$ or 3 ✓

$x = 3-(-1)$ or $3-(3)$

$= 4$ ✓ $\quad = 0$ ✓ (5)

1.3. $(\sqrt{5})^x - (\sqrt[3]{2})^y = 17$

$(5^{\frac{1}{2}})^x - (2^{\frac{1}{3}})^y = 17$

LHS ✓ RHS ✓

$5^{\frac{x}{2}} - 2^{\frac{y}{3}} = 25 - 8$

$5^{x/2} - 2^{y/3} = 5^2 - 2^3$

$5^{x/2} = 5^2$ $\quad 2^{y/3} = 2^3$

$\therefore \frac{x}{2} = 2$ ✓ $\quad \frac{y}{3} = 3$

$x = 4$ $\quad y = 9$

$P = 4 \times 9$ ✓

$= 36$ →

(4)

2.1. $36 + 18 + 9 + \frac{9}{2} + \ldots$

cm^2

1. $r = \frac{18}{36}$

$= \frac{1}{2}$

$-1 < \frac{1}{2} < 1$ ✓

$\therefore$ Yes ✓, the series does converge (2)

2. $S_\infty = \frac{a}{1-r}$

$= \frac{36}{1 - \frac{1}{2}}$ ✓

$= 72\ cm^2$ ✓ (2)

3. $l = \frac{3}{8}$

$\therefore A = \left(\frac{3}{8}\right)^2 = \frac{9}{64}$ ✓

$T_n = ar^{n-1}$

$\frac{9}{64} = 36\left(\frac{1}{2}\right)^{n-1}$ ✓

$\frac{1}{256} = \left(\frac{1}{2}\right)^{n-1}$

$n - 1 = \frac{\log \frac{1}{256}}{\log \frac{1}{2}}$

$n = 9$ ✓

$\therefore$ square 9 → (3)

2.1. 4.

	Sides	Diag
Sq 1	6	$\sqrt{6^2+6^2}$
		$= 6\sqrt{2}$
Sq 2	$\sqrt{18}$	6
Sq 3	3	$3\sqrt{2}$

Sum of diags

Sq 1	$2 \times 6\sqrt{2} = 12\sqrt{2}$
Sq 2	12
Sq 3	$6\sqrt{2}$

✓ $12\sqrt{2} + 12 + 6\sqrt{2} + \ldots$ 10 terms

$r = \frac{1}{\sqrt{2}}$ ✓ $\quad a = 12\sqrt{2}$

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

$$S_{10} = \frac{12\sqrt{2}\left(\left(\frac{1}{\sqrt{2}}\right)^{10} - 1\right)}{\frac{1}{\sqrt{2}} - 1}$$ ✓

$= 56,13$ cm ✓ (4)

2.2. $T_7 = 4$ ✓ $\quad T_{12} = 14$

$a + 6d = 4 \quad a + 11d = 14$

1. $a = 4 - 6d$

$4 - 6d + 11d = 14$

$5d = 10$

$d = 2$ ✓

$a = 4 - 6(2)$

$= -8$ ✓ (3)

2.2. 2. Add inv of -8 → add up to 0!

$= +8$

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

$8 = -8 + (n-1)(2)$ ✓

$16 = 2n - 2$

$9 = n$

$\therefore T_9$ ✓ (2)

2.3. $\sum_{p=k}^{100} (4p - 1) = 19\,995$

$4k - 1 + 4(k+1) - 1 + 4(k+2) - 1 + \ldots + 4(100) - 1$

$= 4k - 1 + 4k + 3 + 4k + 7 + \ldots + 399$

$a = 4k - 1$ ✓

$d = 4k + 3 - (4k - 1)$

$= 4k + 3 - 4k + 1$

$= 4$

$n = 100 - k + 1$

$= 101 - k$ ✓

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

$$19995 = \frac{(101-k)(2(4k-1) + (101-k-1)(4))}{2}$$ ✓

$39990 = (101-k)(8k - 2 + 400 - 4k)$

$= (101-k)(398 + 4k)$

$= 40\,198 + 6k - 4k^2$

$4k^2 - 6k - 208 = 0$

(3)

$\div 2$: $2k^2 - 3k - 104 = 0$ ✓

$(k-8)(2k+13) = 0$

$k = 8$ ✓ or $-\frac{13}{2}$

reject

5

3.1. 3 ; 12 ; 33 ; 66 ; ...

9 ; 21 ; 33

12 ; 12

1. 111 ✓✓ 1

2. $T_n = 6n^2 - 9n + 6$

$T_9 = 6(9)^2 - 9(9) + 6$

$= 411$ ✓

$T_5 = 111$

$\therefore T_9 - T_5 = 411 - 111$

$= 300$ ✓ 2

3.2. $T_n = an^2 + bn + 1$

• $T_4 = a(4)^2 + b(4) + 1$

$27 = 16a + 4b + 1$ ✓

$26 = 16a + 4b$

$\div 2$: $13 = 8a + 2b \quad \ldots 1$

• $T_3 - T_2 = 8$

$a(3)^2 + b(3) + 1 - (a(2)^2 + b(2) + 1) = 8$

$9a + 3b + 1 - (4a + 2b + 1) = 8$

$9a + 3b + 1 - 4a - 2b - 1 = 8$

$5a + b = 8 \quad \ldots 2$ ✓

$b = 8 - 5a$

✓ method sub. elim

$13 = 8a + 2(8 - 5a)$

$= 8a + 16 - 10a$

$-3 = -2a$

$3/2 = a$ ✓

$b = 8 - 5(3/2)$

$= \frac{1}{2}$ ✓

(5)

4.1. 1.f: $y = x^2 - 2x - 3$

- parabola
- y int: $y = -3$ ✓
- x int: $0 = x^2 - 2x - 3$

$= (x - 3)(x + 1)$

$\therefore x = -1$ or 3 ✓

- tp: $x = -\frac{(-2)}{2(1)}$

$= 1$

$y = (1)^2 - 2(1) - 3$

$= -4$

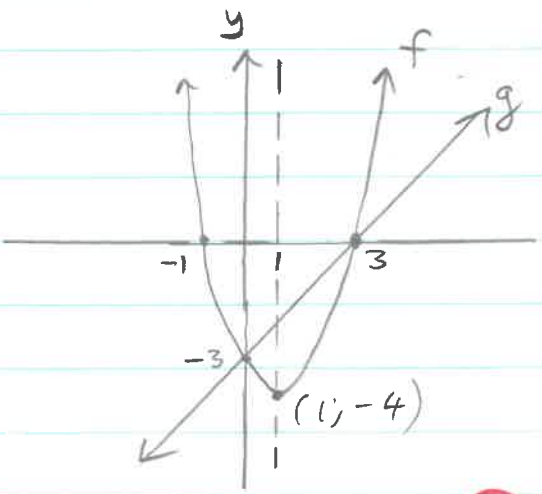
$(1; -4)$ ✓

shape: $a = 1$: ↺ ✓

g: $y = x - 3$

- str line
- y int: $y = -3$ ✓
- x int: $0 = x - 3$

$3 = x$ ✓



(6)

4.1. 2(a) $f(x) > g(x)$

$y_f > y_g$

f above g

$x \in (-\infty; 0)$ or $(3; \infty)$ ✓ ✓

(2)

2(b) $f(x) \cdot g(x) \leq 0$

$y_f \cdot y_g \leq 0$

$x \in (-\infty; -1]$ or $x = 3$ ✓ ✓

(2)

4.1. 3. R_f : $y \in [-4; \infty)$

$+4$: $y \in [0; \infty)$

$x\ -1$: $y \in [0; -\infty)$

$\times\times\times$

R_h : $y \in (-\infty; 0]$ ✓✓

(2)

OR

$h(x) = -[f(x) + 4]$

$= -[x^2 - 2x - 3 + 4]$

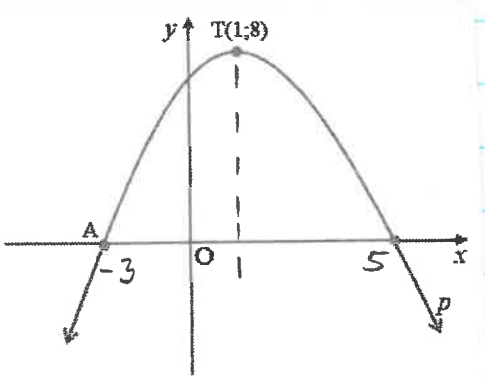
$= -x^2 + 2x - 1$

$x_{tp} = \frac{-(2)}{2(-1)} = 1$ $\quad y_{tp} = -(1)^2 + 2(1) - 1 = 0$

$\cap\!\!-\!\!-\!\!-0$

$y \in (-\infty; 0]$

4.2.



$p' = -x + 1$

grad of tan $= 4$

$\therefore\ 4 = -x + 1$

$x = -3$

$\therefore A(-3; 0)$ ✓

$y = a(x-1)^2 + 8$

sub $A(-3; 0)$

$0 = a(-3-1)^2 + 8$ ✓

$-8 = a \cdot 16$

$-\frac{1}{2} = a$ ✓

$\therefore y = -\frac{1}{2}(x-1)^2 + 8$ ✓

(4)

OR

$\frac{-3+x}{2} = 1$

$-3 + x = 2$

$x = 5$

$y = a(x+3)(x-5)$

sub $T(1; 8)$

$8 = a(1+3)(1-5)$

$8 = a \cdot -16$

$a = -\frac{1}{2}$

$\therefore\ y = -\frac{1}{2}(x+3)(x-5)$

- multiplied out :

$y = -\frac{1}{2}(x^2 - 2x + 1) + 8$

$= -\frac{1}{2}x^2 + x - \frac{1}{2} + 8$

$= -\frac{1}{2}x^2 + x + \frac{15}{2}$

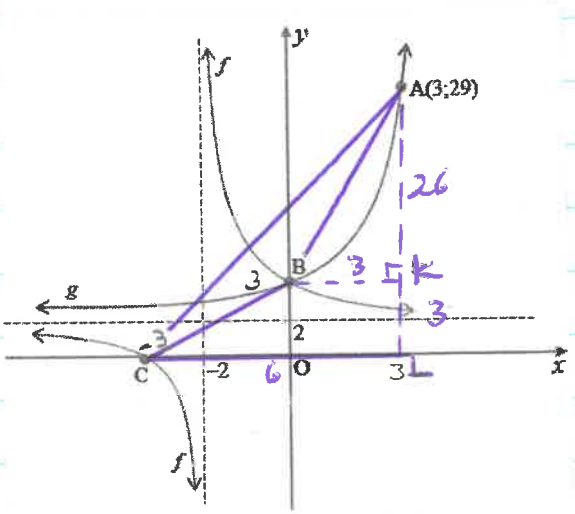
OR

$y = -\frac{1}{2}(x+3)(x-5)$

$= -\frac{1}{2}(x^2 - 2x - 15)$

$= -\frac{1}{2}x^2 + x + \frac{15}{2}$

5.



f: $y = \frac{2}{x+p} + q$

g: $y = b^x + 2$ $\quad y = 3^x + 2$

1. y int: $y = b^0 + 2$

$= 1 + 2$

$= 3$

$\therefore B(0;3)$ ✓ (1)

2. R_g : $y \in (2;\infty)$ ✓ (1)

3. $y = b^x + 2$

sub $A(3;29)$

$29 = b^3 + 2$ ✓

$27 = b^3$

$\sqrt[3]{27} = b$

$3 = b$ ✓ (2)

5.4. $y = \frac{2}{x+p} + q$

ha $y = q$ $\quad y = 2$

$q = 2$

va: $x + p = 0$ $\quad x = -2$

$x = -p$

$-p = -2$

$p = 2$

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

x int: $0 = \frac{2}{x+2} + 2$ ✓

$-2 = \frac{2}{x+2}$

$-2(x+2) = 2$

$x = -3$

$C(-3; 0)$ ✓ (2)

5.5. $h(x) = g(x) - 2$

$= 3^x + 2 - 2$

h: $y = 3^x$ ✓

h^{-1}: $x = 3^y$ ✓

$y = \log_3 x$ ✓ (3)

5.6. $y = x$

$\therefore y = x + 2 + 2$ ✓

$= x + 4$ ✓ (2)

5.7 $f(x) \cdot g'(x) \leq 0$

y_f . $+$ $\quad \underline{0}$

✓✓

$\therefore x \in [-3; -2)$ (2)

5.8. $AK = 29 - 3 = 26$

$KL = 3$

$CL = 6$

$BK = 3$

$\Delta ACL = \frac{1}{2}(6)(29) = 87$ ✓

$\Delta ABK = \frac{1}{2}(3)(26) = 39$ ✓

Trap $BKLC = \frac{1}{2}(6+3).3$

$= \frac{27}{2}$ ✓

$\therefore \Delta ABC$

$= 87 - 39 - \frac{27}{2}$

$= \frac{69}{2}$ u² ✓ $\quad 34,5$ (4)

6.1. 1. $1 + i_{ea} = \left(1 + \frac{i_{nom}}{k}\right)^{k}$

$1 + i_{ea} = \left(1 + \frac{6,5}{1200}\right)^{12}$ ✓

$I_{ea} = 6,6972\ \%\ pa$ ✓✓

(3)

2. $A = P(1+i)^{n}$

$= 500\,000\left(1 + \frac{6,5}{1200}\right)^{5\times12}$ ✓

$= R\ 691\ 408,66$ ✓

(2)

OR

$A = 500\,000\left(1 + \frac{6,6972}{100}\right)^{5}$

$= R\ 691\,409,14$

6.2. $A = P(1-i)^{n}$

$250\,000 = 800\,000\left(1 - \frac{20,75}{100}\right)^{n}$ ✓

$\frac{5}{16} = \left(\frac{317}{400}\right)^{n}$

$n = \frac{\log \frac{5}{16}}{\log \frac{317}{400}}$ ✓

$= 5\ yrs$ ✓

(3)

6.3.

Parallel

- 650 197

$T_0 - T_5$

$A = 650\,197\left(1 + \frac{6,1}{1200}\right)^{5\times12}$

$= 881\,392,28\ldots$ ✓✓

$T_5 - T_{10}$

$A = 881\,392,28\ldots\left(1 + \frac{7,47}{400}\right)^{5\times4}$

$= 1\,276\,092,64\ldots$ ✓ A

- x

$T_5 - T_{10}$

$A = x\left(1 + \frac{7,47}{400}\right)^{5\times4}$

$= x \cdot 1,44\ldots$ ✓ B

$1\,276\,092,64\ldots + x \cdot 1,44\ldots = 2\,000\,000$ ✓

$1,44\ldots x = 723\,907,35\ldots$

$x = R\ 500\,000,03$ ✓

(6)

OR

Snowball

$T_0 - T_5$

$A = 650197\left(1+\frac{6,1}{1200}\right)^{5\times 12}$ ✓

$= 881\,392,28\ldots$ ✓ A

$T_5 - T_{10}$

$2\,000\,000 = (881392,28\ldots + x)\left(1+\frac{7,147}{400}\right)^{20}$ ✓ ✓

$\therefore 1\,381\,392,31\ldots = 881\,392,28\ldots + x$ ✓

$R\,500\,000,03 = x$ ✓

OR

$650\,197$

$A = 650\,197\left(1+\frac{6,1}{1200}\right)^{60}\left(1+\frac{7,147}{400}\right)^{20}$ ✓ ✓

$= 1\,276\,092,64\ldots$ ✓

$2\,000\,000 - 1\,276\,092,64\ldots$

$= 723\,907,35\ldots$ ✓

$723\,907,35\ldots = x\left(1+\frac{7,147}{400}\right)^{20}$ ✓

$R\,500\,000,03 = x$ ✓

71. $f(x) = x^2 + x$

$f(x+h) = (x+h)^2 + (x+h)$

$= x^2 + 2xh + h^2 + x + h$ ✓

$f'(x)$

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

$= \lim_{h\to 0} \frac{x^2+2xh+h^2+x+h-(x^2+x)}{h}$ ✓

$= \lim_{h\to 0} \frac{x^2+2xh+h^2+x+h-x^2-x}{h}$

$= \lim_{h\to 0} \frac{2xh+h^2+h}{h}$ ✓

$= \lim_{h\to 0} \frac{h(2x+h+1)}{h}$ ✓

$= \lim_{h\to 0} (2x+h+1)$

$= 2x + 0 + 1$

$= 2x + 1$ ✓ (5)

72 1. $f(x) = 3x^4 - \frac{1}{2}x^{-2}$

$f'(x) = 12x^3 + x^{-3}$ ✓ ✓ (2)

2. $Dx\left[\frac{x+4}{\sqrt{x}}\right]$

$= Dx\left[\frac{x+4}{x^{\frac{1}{2}}}\right]$

$= Dx\left[\frac{x}{x^{\frac{1}{2}}} + \frac{4}{x^{\frac{1}{2}}}\right]$

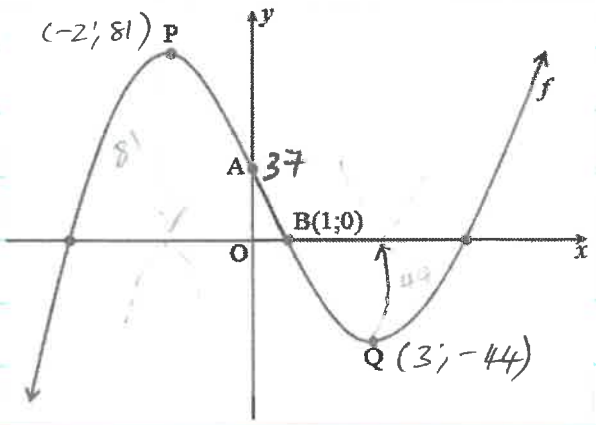
$= D_x\left[x^{1-\frac{1}{2}} + 4x^{-\frac{1}{2}}\right]$

$= D_x\left[x^{\frac{1}{2}} + 4x^{-\frac{1}{2}}\right]$ ✓ ✓

$= \frac{1}{2}x^{-\frac{1}{2}} - 2x^{-3/2}$ ✓ ✓

(4)

8.



$f: y = 2x^3 - 3x^2 + cx + 37$

$y = 2x^3 - 3x^2 - 36x + 37$

8.1. $OA = 37$ ✓ (1)

8.2. $y = 2x^3 - 3x^2 + cx + 37$

sub B(1;0)

$0 = 2(1)^3 - 3(1)^2 + c(1) + 37$ ✓

$0 = 2 - 3 + c + 36$ ✓

$-36 = c$ (2)

8.3. tp: $f' = 0$

$6x^2 - 6x - 36 = 0$ ✓ ✓

$\div 6: \quad x^2 - x - 6 = 0$

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

$x = 3$ or -2 ✓

P: $y = 2(-2)^3 - 3(-2)^2 - 36(-2) + 37$

$= 81$

$P(-2; 81)$ ✓

81 −44

Q: $y = x(3)^3 - 3(3)^2 - 36(3) - 37$

$= -44$

$Q(3; -44)$ ✓

(4)

8.4 $f' \geq 0$

f incr or stat ✓ ✓

$x \in (-\infty; -2]$ or $[3; \infty)$ ✓

(2)

8.5. $g(x) = f(x) + k$

g 1 real root

$g(x) = 2x^3 - 3x^2 - 36x + 37 + k$

yint : $37 + c$

⇕

yint $> 37 + 44$ or yint $< 37 - 81$

$37 + k > 81$ ✓ $37 + k < -44$ ✓

$k > 44$ ✓ $k < -81$ ✓

(2)

8.6. $f''(x) = 12x - 6$ ✓

$f''(1) = 12(1) - 6$

$= 6$ ✓

> 0 +

∴ f concave UP ✓

(3)

9. open box square

$TSA = x^2 + 4xh$

$300 = x^2 + 4xh$ ✓

$300 - x^2 = 4xh$

$\frac{300 - x^2}{4x} = h$ ✓

$V = x^2 h$

$= x^2\left(\frac{300 - x^2}{4x}\right)$ ✓

$= \frac{x}{4}(300 - x^2)$

$= 75x - \frac{1}{4}x^3$ ✓

max V: $V' = 0$

$75 - \frac{3}{4}x^2 = 0$ ✓ LHS + RHS

$-\frac{3}{4}x^2 = -75$

$x^2 = 100$

$x = \pm\sqrt{100}$ ✓

$= 10$ cm ✓

∴ $V_{max} = 75(10) - \frac{1}{4}(10)^3$

$= 500\ cm^3$ ✓

(7)

CA: x open

$h = \frac{300 - 2x^2}{4x} = \frac{150 - x^2}{2x}$

$V = 75x - \frac{1}{2}x^3$

$75 - \frac{3}{2}x^2 = 0$

$x = \sqrt{50}$ $5\sqrt{2}$

$= 7{,}07\ldots$ cm

$V = 353{,}55\ cm^3$

10.1. 1. Mut. excl.

$P(A \cap B) = 0$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$0,52 = 0,4 + x - 0$

$0,12 = x$ 3/25 (2)

2. Ind. even

$P(A \cap B) = P(A) \cdot P(B)$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B) = P(A) + P(B) - P(A) \cdot P(B)$

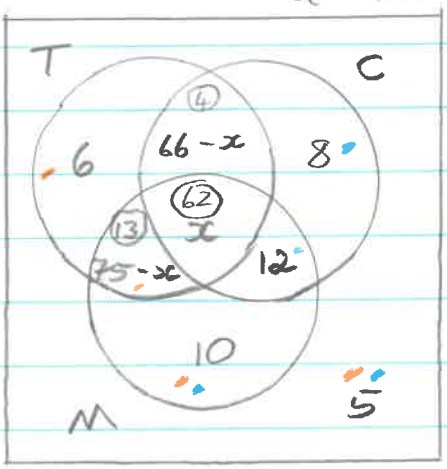
$0,52 = 0,4 + x - 0,4x$

$0,12 = 0,6x$ 1-0,4

$0,2 = x$ (3)

10.2 1.

$U = 120$



$35 - (8 + 10 + 3) = 12$

5 6 8 10 ✓

x 66 - x 75 - x ✓

12 ✓ (3)

10.2. 2.

$120 = 6 + 66 - x + 8 + 75 - x + x + 12 + 10 + 5$

$120 = 182 - x$

$x = 62$ (2)

3. $P(C \cap T)$

$= \frac{66}{120}$ ✓

$= \frac{11}{20}$ 0,55 (1)

4. $P(\text{at least 2 bev.})$

$= P(\geq 2 \text{ bev.})$

• $66 - x = 66 - 62 = 4$

• $75 - x = 75 - 62 = 13$

$\therefore \frac{13 + 4 + 12 + 62}{120}$

$= \frac{91}{120}$ ✓ 0,76 (1)

5. $P(C' \text{ and } T')$

$=$ • •

$= \frac{10 + 5}{120}$

$= \frac{15}{120}$ ✓✓

$= \frac{1}{8}$ 0,13 (2)