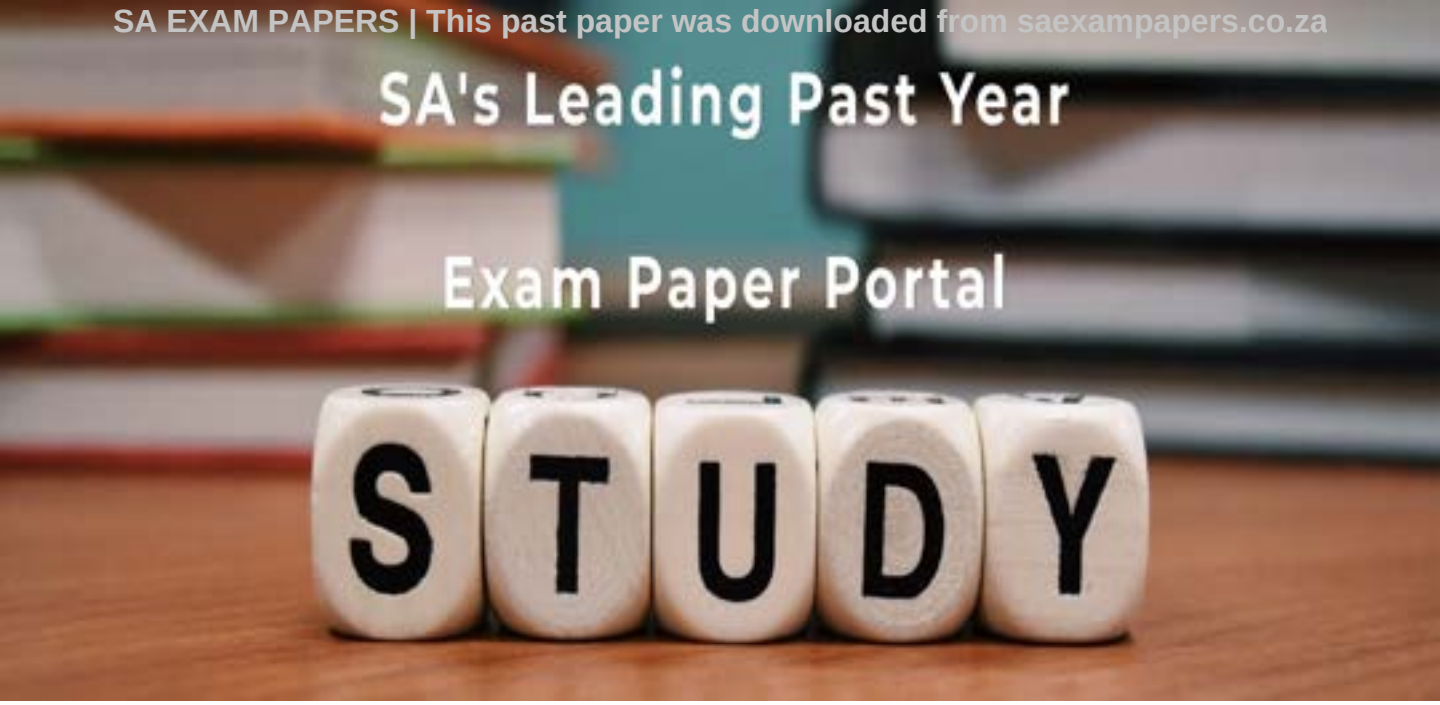

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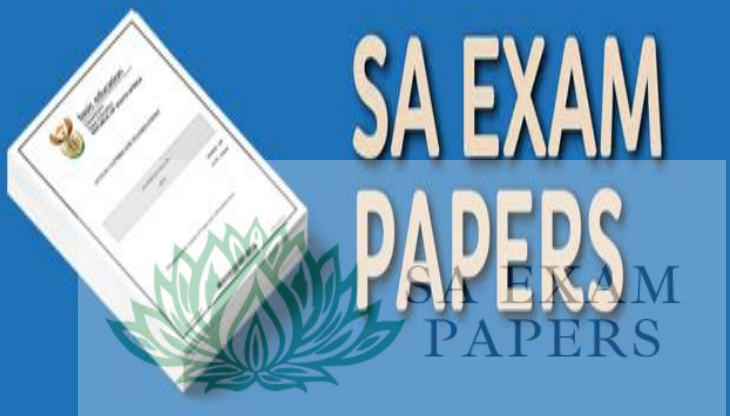


education

Department of Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION
VOORBEREIDENDE EKSAMEN

GRADE/*GRAAD* 12

MATHEMATICS P1
WISKUNDE V1

SEPTEMBER 2024

MARKS/*PUNTE*: 150

MARKING GUIDELINES
NASIENRIGLYNE

These marking guidelines consist of 15pages.
Hierdie nasienriglyne bestaan uit 15 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 guideline.
- Assuming answers/values to solve a problem is UNACCEPTABLE.

NOTA:

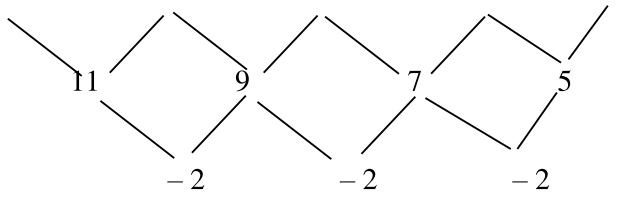
- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas.*
- *Om antwoorde/waardes aan te neem om 'n probleem op te los, is ONAANVAARBAAR.*

QUESTION/*VRAAG* 1

1.1.1	$x = 7 \text{ or } x = -10$	✓ $x = 7$ ✓ $x = -10$ (2)
1.1.2	$3x(2x+1) = 1$ $6x^2 + 3x - 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-3 \pm \sqrt{(3)^2 - 4(6)(-1)}}{2(6)}$ $x = \frac{-3 \pm \sqrt{33}}{12}$ $x = 0{,}23$ or $x = -0{,}73$ **OR/*OF*** $6x^2 + 3x - 1 = 0$ $x^2 + \frac{1}{2}x + \frac{1}{4} = \frac{1}{6} + \frac{1}{4}$ $(x + \frac{1}{2})^2 = \frac{5}{12}$ $x = \frac{-3 \pm \sqrt{33}}{12}$ $x = 0{,}23$ or $x = -0{,}73$	✓ standard form ✓ substitution into correct formula ✓ $x = 0{,}23$ ✓ $x = -0{,}73$ (4) **OR** ✓ standard form ✓ $(x + \frac{1}{2})^2 = \frac{5}{12}$ ✓ $x = 0{,}23$ ✓ $x = -0{,}73$ (4)
1.1.3	$6x^2 + 7x + 2 \geq 0$ $(3x+2)(2x+1) \geq 0$ C/V $-\frac{2}{3}$ & $-\frac{1}{2}$ $x \leq -\frac{2}{3} \text{ or } x \geq -\frac{1}{2}$ And then max $\frac{1}{3}$	✓ factors/CV's ✓✓ answers (**combo marks**) (3)
1.1.4	$\sqrt{\sqrt{2x} + x} = 2$ $\left(\sqrt{\sqrt{2x} + x}\right)^2 = (2)^2$ $\sqrt{2x} + x = 4$ $\left(\sqrt{2x}\right)^2 = (4 - x)^2$ $2x = 16 - 8x + x^2$ $x^2 - 10x + 16 = 0$ $(x-2)(x-8) = 0$ $x = 2 \quad or \quad x = 8$ $x \neq 8$	✓ squaring both sides ✓ squaring both sides ✓ standard form ✓ factors ✓ answers (with selection) (5)

1.2	$-2y + x = 4 \; and \; x^2 + xy - 2y^2 = 0$ $x = 2y + 4$ $x^2 + xy - 2y^2 = 0$ $(2y + 4)^2 + y(2y + 4) - 2y^2 = 0$ $4y^2 + 16y + 16 + 2y^2 + 4y - 2y^2 = 0$ $4y^2 + 20y + 16 = 0$ $y^2 + 5y + 4 = 0$ $(y + 1)(y + 4) = 0$ $y = -1 \; or \; y = -4$ $x = 2(-1) + 4 \; or \; x = 2(-4) + 4$ $x = 2 \; or \; x = -4$	✓ $x = 2y + 4$ ✓ substitution ✓ standard form ✓ both *y* values ✓ both *x* values (5)
1.3	$4^m = p(2^{2m-1}) + p$ $2^{2m} = \frac{p.2^{2m}}{2} + p$ $2^{2m} - \frac{p.2^{2m}}{2} = p$ $2^{2m}\left(1 - \frac{p}{2}\right) = p$ $\therefore \quad 2^{2m} = p \div \left(1 - \frac{p}{2}\right)$ $2^{2m} = \frac{2p}{2 - p}$ $2m = log_2\left(\frac{2p}{2 - p}\right)$ $m = \frac{1}{2} log_2\left(\frac{2p}{2 - p}\right)$	✓ $2^{2m} = \frac{p.2^{2m}}{2} + p$ ✓ Factorisation ✓ simplification: ✓ log form (4)
		[23]

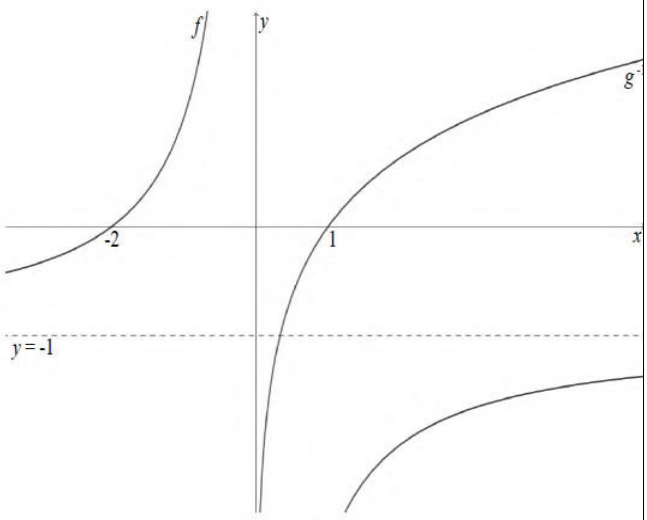
QUESTION/*VRAAG* 2

2.1.	... ; ... ; 0 ; 7 ; 12 ;  $T_1 = -20$	✓First differences ✓ $T_1 = -20$ (2)
2.2	$2a = -2$ $\therefore a = -1$ $3a + b = 11$ $3(-1) + b = 11$ $\therefore b = 14$ $a + b + c = -20$ $-1 + 14 + c = -20$ $\therefore c = -33$ $T_n = -n^2 + 14n - 33$ Answer only: full marks	✓ $a = -1$ ✓ $b = 14$ ✓ $c = -33$ ✓ $T_n = -n^2 + 14n - 33$ (4)
2.3	$T_n = -n^2 + 14n - 33$ $n = \frac{-14}{2(-1)}$ $n = 7$ Max value= 16 $T_7 = 16$ Answer only: full marks **OR/*OF*** $T_n^{/} = -2n + 14$ $0 = -2n + 14$ $\therefore n = 7$ $n = 7$ $T_7 = 16$ WILL HAVE THE HIGHEST VALUE	✓ ✓ method ✓ $n = 7$ (3) ✓ ✓ method ✓ $n = 7$ (3)
		[9]

QUESTION/*VRAAG* 3

3.1.1	$(2x+4)-(10x+6)=(4x-8)-(2x+4)$ $-8x-2=2x-12$ $-10x=-10$ $x=1$	✓equating ✓ $x=1$ (2)
3.1.2	$16:6:-4$ $T_{10}=16+(10-1)(-10)$ $=-74$	✓ sequence ✓ substitution ✓ answer (3)
3.1.3	$S_{99}=\frac{99}{2}[2(16)+(99-1)(-10)]$ $=-46926$	✓ substitution ✓ answer (2)
3.2.1	$r=k-5$ $-1<k-5<1$ $4<k<6$	✓ Common ratio ✓ substitution ✓ answer (3)
3.2.2	$a=-1$ or $r=-\frac{1}{2}$ $S\infty=\frac{-1}{1-\left(-\frac{1}{2}\right)}$ $=-\frac{2}{3}$	✓ *a* and *r* ✓ substitution ✓ answer (3)
3.3	$x;\ 3x;\ 10x-20$ $\frac{10x-20}{3x}=\frac{3x}{x}$ $10x-20=9x$ $x=20$ $20;60;200$	✓ Sequence in terms of *x* ✓ ratio ✓ $x=20$ ✓ numbers (4)
		[17]

QUESTION/*VRAAG* 4

4.1	$g(x)=k^x$ $3=k^1$ $\therefore k=3$	✓ substitution ✓ $k=3$ (2)
4.2	$x=0$ $y=-1$	✓ $x=0$ ✓ $y=-1$ (2)
4.3	$g(x)=3^x$ $\therefore x=3^y$ $\therefore g^{-1}(x)=\log_3 x$ Answer only: full marks	✓ interchange ✓ answer (2)
4.4	$0=\frac{-2}{x}-1$ $1=\frac{-2}{x}$ $x=-2$	✓ $y=0$ ✓ $x=-2$ (2)
4.5		$f(x)$ ✓ asymptote ✓ x-intercept ✓ shape (Q2 and Q4) $g(x)^{-1}$ ✓ x- intercept ✓ increasing shape (5)

4.6	$y = -(x + p) + q$ $y = -(x + 0) - 1$ $y = -x - 1$ $\frac{-2}{x} - 1 = -x - 1$ $\therefore -2 - x = -x^2 - x$ $\therefore x^2 = 2$ $\therefore x = \pm\sqrt{2}$ **OR/*OF*** $y = -x + c$ $-1 = -(0) + c$ $\therefore c = -1$ $\therefore y = -x - 1$ $\frac{-2}{x} - 1 = -x - 1$ $\therefore -2 - x = -x^2 - x$ $\therefore x^2 = 2$ $\therefore x = \pm\sqrt{2}$	✓ $y = -x - 1$ ✓ equating ✓Simplification ✓both answers (4) ✓ $y = -x - 1$ ✓ equating ✓ $x^2 = 2$ Simplification ✓both answers (4)
4.7	$-2 < x \leq 1$	✓✓ answer (2)
		[19]

QUESTION/*VRAAG* 5

5.1	$-x^2 - x + 12 = 0$ $x^2 + x - 12 = 0$ $(x + 4)(x - 3) = 0$ $x = -4$ or $x = 3$ $A(-4;0)$ $B(3;0)$	✓ $f(x) = 0$ ✓ factors ✓ both x values (3)
5.2	$x = -\frac{b}{2a} = -\frac{-1}{2(-1)}$ $= -\frac{1}{2}$ $\therefore f\left(-\frac{1}{2}\right) = -\left(-\frac{1}{2}\right)^2 - \left(-\frac{1}{2}\right) + 12$ $= \frac{49}{4}$ $\therefore y \leq \frac{49}{4}$ **OR/*OF*** $x = \frac{-4 + 3}{2}$ $= -\frac{1}{2}$ $\therefore f\left(-\frac{1}{2}\right) = -\left(-\frac{1}{2}\right)^2 - \left(-\frac{1}{2}\right) + 12$ $= \frac{49}{4}$ $\therefore y \leq \frac{49}{4}$	✓ $x-$value ✓ $y-$value ✓ Answer ✓ $x-$value ✓ $y-$value ✓ Answer (3)
5.3	$k(x) = 3^{\frac{49}{4} - 12}$ $= 3^{0.25}$ $= 1{,}32$	✓ *subst* ✓ Answer (2)
5.4	$x < -4$ or $0 < x < 3$	✓ $x < -4$ ✓ $0 < x < 3$ (2)

5.5 Check Afr	$\frac{-1}{4} < 12 - k < 0$ $12 < k < \frac{49}{4}$	✓ ✓Answer (2)
5.6	$h(x) = -(x - \frac{5}{2})^2 + \frac{49}{4}$	✓$-(x - \frac{5}{2})^2$ ✓ $\frac{49}{4}$ (2)
		[14]

QUESTION/*VRAAG* 6

6.1	$A = 150\,000(1-0{,}13)^6$ $= R65\,043{,}93$	✓ correct substitution in correct formula ✓$n = 6$ & $i = 0{,}13$ ✓ Answer (3)
6.2.1	$A = 300\,000\left(1+\frac{0.053}{4}\right)^2$ $= R308\,002{,}67$	✓ 4 and 2 ✓ correct substitution in correct formula ✓ Answer (3)
6.2.2	$308\,002{,}67 = \frac{x\left[1-\left(1+\frac{0{,}053}{4}\right)^{-72}\right]}{\frac{0{,}053}{4}}$ $x = \frac{308\,002{,}67 \times \frac{0{,}053}{4}}{\left[1-\left(1+\frac{0{,}053}{4}\right)^{-72}\right]}$ $x = R6\,664{,}20$	✓ correct substitution in correct formula ✓ Simplification ✓ Answer (3)
6.3	$1+i_{eff} = \left(1+\frac{0.079}{12}\right)^{12}$ $i_{eff} = 0{,}01321000694$ $1+0{,}01321000694 = \left(1+\frac{i_{nom}}{4}\right)^4$ $i_{nom} = 0{,}01314506756$ Quarterly deposit$= 27562.50 \times 0.11 = 3031{,}88$ $F = \frac{3031{,}88\left[\left(1+\frac{0{,}01314506756}{4}\right)^{32}-1\right]}{\frac{0{,}01314506756}{4}}$ $F = R\,102\,128{,}44$	✓answer ✓answer ✓answer ✓32 ✓ Correct substitution into the future value annuity ✓Answer (6)
		[15]

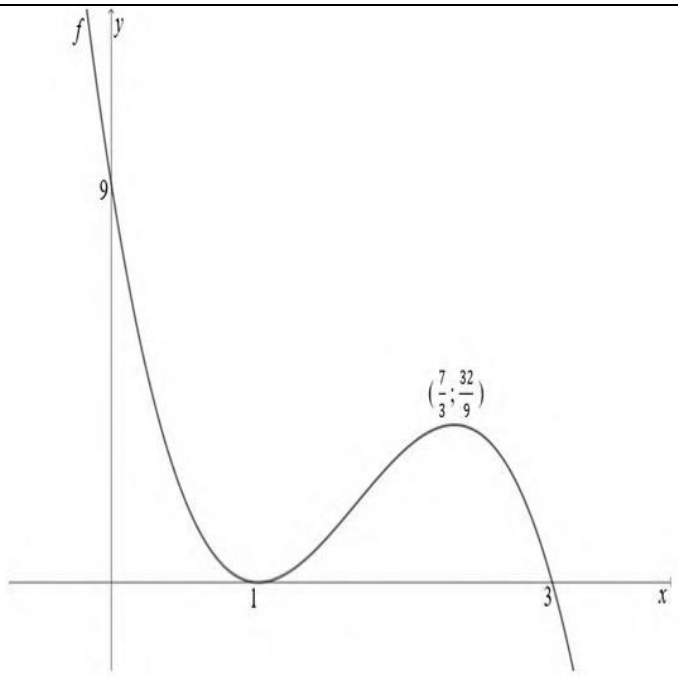
QUESTION/*VRAAG* 7

7.1	$f(x) = -1 + 4x^2$ $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h\to 0} \frac{-1 + 4x^2 + 8xh + 4h^2 - (-1 + 4x^2)}{h}$ $= \lim_{h\to 0} \frac{8xh + 4h^2}{h}$ $= \lim_{h\to 0} \frac{h(8x + 4h)}{h}$ $= \lim_{h\to 0} (8x + 4h)$ $= 8x$ **OR/*OF*** $f(x+h) = -1 + 4(x+h)^2$ $= -1 + 4x^2 + 8xh + 4h^2$ $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h\to 0} \frac{-1 + 4x^2 + 8xh + 4h^2 - (-1 + 4x^2)}{h}$ $= \lim_{h\to 0} \frac{8xh + 4h^2}{h}$ $= \lim_{h\to 0} \frac{h(8x + 4h)}{h}$ $= \lim_{h\to 0} (8x + 4h)$ $= 8x$	✓$f(x+h) = -1 + 4x^2 + 8xh + 4h^2$ ✓ substitution ✓ simplification ✓ common factor ✓ answer ✓$f(x+h) = -1 + 4x^2 + 8xh + 4h^2$ ✓ substitution ✓ simplification ✓common factor ✓ answer (5)
7.2.1	$D_x[(2x^3 + 5)^2]$ $= D_x[4x^6 + 20x^3 + 25]$ $= 24x^5 + 60x^2$	✓ expansion ✓ $24x^5$ ✓ $60x^2$ (3)
7.2.2	$y = 3x^4 - \frac{7}{x} + 2.\sqrt[3]{x^2}$ $y = 3x^4 - 7x^{-1} + 2x^{\frac{2}{3}}$ $\frac{dy}{dx} = 12x^3 + 7x^{-2} + \frac{4}{3}x^{-\frac{1}{3}}$	✓ $-7x^{-1} + 2x^{\frac{2}{3}}$ ✓ $12x^3$ ✓ $7x^{-2}$ ✓ $\frac{4}{3}x^{-\frac{1}{3}}$ (4)

7.3	$y + 5x = 4$ $y = -5x + 4$ $m_T = \frac{1}{5}$ $y = 2x^2 + 3x + 1$ $\frac{dy}{dx} = 4x + 3$ $4x + 3 = \frac{1}{5}$ $4x = -\frac{14}{5}$ $x = \frac{-14}{20}$ $x = -\frac{7}{10}$ $y = 2\left(-\frac{7}{10}\right)^2 + 3\left(-\frac{7}{10}\right) + 1$ $y = -\frac{3}{25}$ $\left(-\frac{7}{10}; -\frac{3}{25}\right)$	✓ gradient of tangent ✓ $4x + 3 = \frac{1}{5}$ ✓ x value ✓ y value (4)
		[16]

QUESTION/*VRAAG* 8

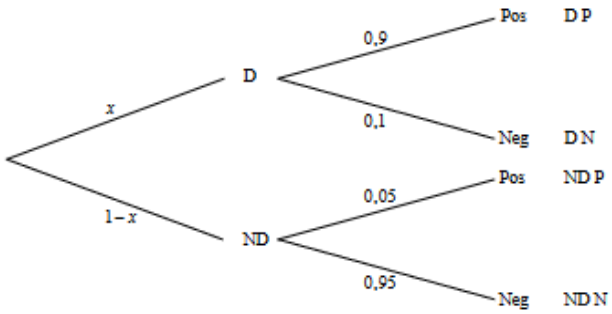
8.1	$f(x) = -3x^3 + 15x^2 - 21x + 9$ x intercepts $(x-1)(-3x^2 + 12x - 9) = 0$ $x - 1 = 0 \; or \; x^2 - 4x + 3 = 0$ $x - 1 = 0 \; or \; (x-1)(x-3) = 0$ $x = 1 \; or \; x = 3$ y intercept $y = 9$ $(0; 9)$	✓ $y = 0$ ✓ factors ✓ Both x- values ✓ $(0; 9)$ (4)
8.2	$f(x) = -3x^3 + 15x^2 - 21x + 9$ $f'(x) = -9x^2 + 30x - 21$ $-9x^2 + 30x - 21 = 0$ $3x^2 - 10x + 7 = 0$ $(3x-7)(x-1) = 0$ $x = \frac{7}{3} \; or \; x = 1$ $f\left(\frac{7}{3}\right) = -3\left(\frac{7}{3}\right)^3 + 15\left(\frac{7}{3}\right)^2 - 21\left(\frac{7}{3}\right) + 9$ $= \frac{32}{9}$ $\left(\frac{7}{3}; \frac{32}{9}\right)$ $f(1) = -3(1)^3 + 15(1)^2 - 21(1) + 9$ $= 0$ $(1; 0)$	✓ $-9x^2 + 30x - 21$ ✓ $f'(x) = 0$ ✓ both x- values ✓ both y values (4)

8.3		✓*y*- intercept ✓ both *x* -intercepts ✓ both turning points ✓ shape (4)
8.4.1	$\left(1;\frac{7}{3}\right)$ *or* $1 < x < \frac{7}{3}$	✓✓ answer (**combo mark**) (2)
8.4.2	$0 < k < \frac{32}{9}$	✓✓ answer (**combo mark**) (2)
		[16]

QUESTION/*VRAAG* 9

9.1	let x be the number of R20 increases in price $Price = 400 + 20x$ $Quantity = 200 - 4x$ $Profit = (400 + 20x)(200 - 4x)$ $= 80\,000 + 2\,400x - 80x^2$ $\frac{dr}{dx} = 0$ $2400 - 160x = 0$ $160x = 2\,400$ $x = 15$ $price = 400 + 20(15)$ $= R700$	✓ $Price = 400 + 2x$ ✓ $quantity = 200 - 4x$ ✓ Profit $= 80\,000 - 2\,400x - 80x^2$ ✓ $\frac{dr}{dx} = 2\,400 - 160x$ ✓$\frac{dr}{dx} = 0$ ✓$x = 15$ ✓ $R700$ (7)
		[7]

QUESTION/*VRAAG* 10

10.1.1	$P(A\ or\ B) = P(A) + P(B)$ $0{,}8 = P(A) + 0{,}4$ $P(A) = 0{,}4$	✓ $0{,}8 = P(A) + 0{,}4$ ✓ answer (2)
10.1.2	$P(A\ or\ B) = P(A) + P(B) - P(A) \times P(B)$ $0{,}8 = P(A) + 0{,}4 - 0{,}4P(A)$ $0{,}6P(A) = 0{,}4$ $P(A) = \frac{2}{3}$	✓Substitution ✓$P(A) = \frac{2}{3}$ (2)
10.2	 $P(D\ P) + P(ND\ P) = 0{,}067$ $0{,}9x + 0{,}05(1 - x) = 0{,}067$ $0{,}9x + 0{,}05 - 0{,}05x = 0{,}067$ $0{,}85\ x = 0{,}017$ $x = 0{,}02$ 2% of the population has the disease.	✓$x\ and\ 1 - x$ ✓$0{,}9\ and\ 0{,}1$ ✓$0{,}05\ and\ 0{,}95$ ✓Substitution ✓Simplification ✓Answer (6)
10.3.1	$21 \times 20 \times 19 \times 10 \times 9 \times 8$ $= 5745600$	✓ $21 \times 20 \times 19 \times 10 \times 9 \times 8$ (1)
10.3.2	NO REPEATS P(starting with a 6) $= \frac{21 \times 20 \times 19 \times 1 \times 9 \times 8}{21 \times 20 \times 19 \times 10 \times 9 \times 8}$ $= \frac{1}{10}$ REPEATS P(starting with a 6) $= \frac{21 \times 21 \times 21 \times 1 \times 10 \times 10}{21 \times 21 \times 21 \times 10 \times 10 \times 10}$ $= \frac{1}{10}$	✓ $21 \times 20 \times 19 \times 1 \times 9 \times 8$ ✓ $21 \times 20 \times 19 \times 10 \times 9 \times 8$ ✓$\frac{1}{10}$ (3) ✓ $21 \times 21 \times 21 \times 1 \times 10 \times 10$ ✓ $21 \times 21 \times 21 \times 10 \times 10 \times 10$ ✓$\frac{1}{10}$ (3)
		[14]

TOTAL/*TOTAAL*: 150