GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

VOORBEREIDENDE EKSAMEN

2021

MARKING GUIDELINES/ *NASIENRIGLYNE*

(10611)

MATHEMATICS (PAPER 1)/*WISKUNDE (VRAESTEL 1)*

25 pages/*bladsye*

INSTRUCTIONS AND INFORMATION/*INSTRUKSIES EN INLIGTING*

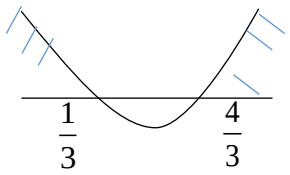
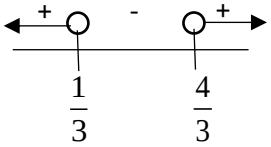
- **A** – ACCURACY /*AKKURAATHEID*
- **CA** – CONSISTENT ACCURACY/*VOLGEHOUE AKKURAATHEID*

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 applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a question is UNACCEPTABLE.

LET WEL:

- *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.*
- *Aannames van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat NIE.*

QUESTION 1/ ***VRAAG 1***		
1.1.1	$3x^2 - 4x = 0$ $x(3x - 4) = 0$ $x = 0$ **or/*of*** $x = \frac{4}{3}$	✓factors/*faktore* ✓both answers/*albei antwoorde* (2)
1.1.2	$3x^2 + 10x - 4 = 0$ $x = \frac{-10 \pm \sqrt{(10)^2 - 4(3)(-4)}}{2(3)}$ $x = -3{,}69$ **or/*of*** $x = 0{,}36$ **NOTE: Penalise 1 mark for incorrect rounding-off in this question ONLY./*Penaliseer 1 punt vir verkeerde afronding SLEGS in hierdie vraag.***	✓substitution into correct formula/ *vervanging in korrekte formule* ✓✓answers/*antwoorde* (3)
1.1.3	$15x - 4 < 9x^2$ $-9x^2 + 15x - 4 < 0$ $9x^2 - 15x + 4 > 0$ $(3x - 1)(3x - 4) > 0$  **OR/*OF***  $x < \frac{1}{3}$ **or/*of*** $x > \frac{4}{3}$ **NOTE: OR must be present. If candidate writes AND penalise 1 mark/*OF moet aangedui word. Indien kandidaat EN skryf, penaliseer met 1 punt.***	✓standard form/ *standaardvorm* (in either form/ *in enige vorm)* ✓factors/*faktore* ✓both answers correct/ *albei antwoorde korrek* (3)
1.1.4	$\sqrt{x^2 - 5} = 2\sqrt{x}$ $x^2 - 5 = 4x$ $x^2 - 4x - 5 = 0$ $(x - 5)(x + 1) = 0$ $x = 5$ **or/*of*** $x \neq 1$ NA/invalid/not a real solution/*NvT/nie reële oplossing/ongeldig*	✓squaring both sides/ *kwadreer albei kante* ✓standard form/ *standaardvorm* ✓factors/*faktore* ✓rejection/*verwerp* (4)

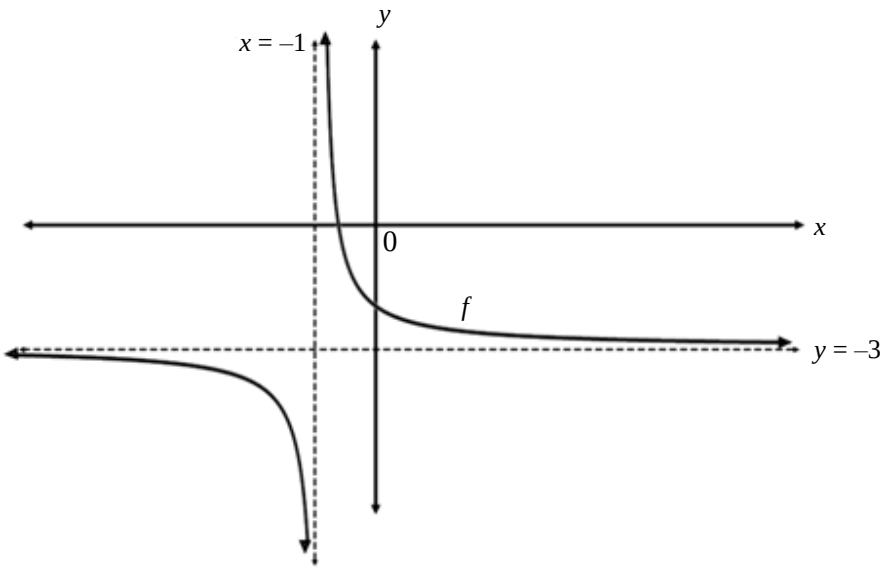
1.2	$(3x-y)^2+(x-5)^2=0$ $(3x-y)^2=0$ and/*en* $(x-5)^2=0$ $3x-y=0$ $x-5=0$ $y=3x$ $x=5$ $\therefore y=3(5)$ $y=15$	✓setting up both equations/*stel beide vergelykings op* ✓value of *x/waarde van x* ✓value of *y/waarde van y* (3)
1.3.1	$x-2=\frac{-4}{x-2}-4$ …. (1) and/*en* $y=x-2$ … (2) substitute/*vervang* (2) into/*in* (1) $y=\frac{-4}{y}-4$ $y+4=\frac{-4}{y}$ $y^2+4y=-4$ $y^2+4y+4=0$	✓setting up new equation for *y* *stel nuwe vergelyking op vir y* ✓simplification/ *vereenvoudiging* (2)
1.3.2	$\Delta = b^2-4ac$ $= 4^2-4(1)(4)$ $= 16-16$ $= 0$ ∴ the roots are real and equal/*wortels is reël en gelyk* **OR/*OF*** $y^2+4y+4=0.$ $(y+2)^2=0$ ∴ $y=-2$ ∴ the roots are real and equal/ *wortels is reël en gelyk*	✓substitution into correct formula/ *vervanging in korrekte formule* ✓ $\Delta = 0$ **OR/*OF*** ✓factors/*faktore* ✓value of *y/waarde van y* (2)

1.4	S will be a maximum if (x^2+2) is a minimum. *S sal 'n maksimum wees indien* (x^2+2) *'n minimum is* The minimum of/*die minimum van* (x^2+2) is 2. $\therefore$ maximum/*maksimum*: $S=\frac{6}{2}$ $S=3$	✓deduction and correct minimum value of/ *aftrekking en korrekte minimum waarde van* (x^2+2) ✓answer/*antwoord* (2)
		[21]
QUESTION 2/ ***VRAAG 2***		
2.1.1	$T_5=81$	✓answer /*antwoord* (1)
2.1.2	1 ; 9 ; 25 ; 49 $\vee\ \vee\ \vee$ 8 16 24 $\vee\ \vee$ 8 8	✓2nd difference/ *2de verskil*
	$2a=8$ $\quad 3a+b=8$ $\quad a+b+c=1$ $a=4$ $\quad 3(4)+b=8$ $\quad 4-4+c=1$ $b=-4$ $\quad c=1$	✓$a=4$ ✓$b=-4$ ✓$c=1$
	$T_n=4n^2-4n+1$ $T_n=(2x-1)(2x-1)$ $T_n=(2x-1)^2$	✓factors/*faktore* (5)

2.1.3	$(2n-1)^2 = 10201$ $\sqrt{(2n-1)^2} = \sqrt{10201}$ $2n-1 = 101$ $2n = 102$ $n = 51$	✓equating/*gelykstel* ✓simplify/*vereenvoudig* ✓answer/*antwoord* (3)
2.2	$35 + 42 + 49 + \ldots 196.$ Sum of natural numbers between 35 and 196, divisible by 7/ *Som van natuurlike getalle tussen* 35 *en* 196, *deelbaar deur* 7 $S_n = \frac{n}{2}(a+l)$ $S_n = \frac{24}{2}(35+196)$ $S_n = 2772$ $n = 196 - 34$ $n = 162$ Sum of all natural numbers between 35 and 196/ *Som van alle natuurlikegetalle tussen* 35 *en* 196 $S_n = \frac{n}{2}(a+l)$ $S_{162} = \frac{162}{2}(35+196)$ $S_{162} = 18711$ $\therefore S_{\text{not divisible by/}niedeelbaar\ deur\ 7} = 18711 - 2772$ $S_{\text{not divisible by/}nie\ deelbaar\ deur\ 7} = 15939$	✓ $n = 24$ ✓substitution into correct formula AND *vervanging in korrekte formule EN* S_n = 2772 ✓ $n = 162$ ✓S_{162} = 18711 ✓answer/*antwoord* (5)
		[14]

QUESTION 3/ ***VRAAG 3***		
3.1.1	$5(3x+1)+5(3x+1)^2+5(3x+1)^3...$ $r=3x+1$ $-1<r<1$ $-1<3x+1<1$ $-2<3x<0$ $-\frac{2}{3}<x<0$	✓value of *r*/*waarde van r* ✓ $-1<r<1$ ✓answers/*antwoorde* (3)
3.1.2	$3x+1$ $=3\left(-\frac{1}{6}\right)+1$ $=\frac{1}{2}$ $\therefore r=\frac{1}{2}$ $a=5\left(\frac{1}{2}\right)$ $a=\frac{5}{2}$ $S_\infty=\frac{a}{1-r}$ $S_\infty=\frac{\frac{5}{2}}{1-\frac{1}{2}}$ $S_\infty=5$	✓value of *r*/*waarde van r* ✓value of *a/waarde van a* ✓substitution into correct formula/ *vervanging in korrekte formule* ✓answer/*antwoord* (4)

3.2	$T_1 = \frac{1}{8} \quad T_2 = \frac{1}{4} \quad T_3 = \frac{1}{2}$ $a = \frac{1}{8}$ and/*en* $r = 2$ $\frac{\frac{1}{8}(2^k - 1)}{2-1} > 30$ $2^k > 241$ $\log_2 241 < k$ $7,912.... < k$ $\therefore k = 8$	✓values of/*waarde van* $T_1 \ T_2 \ T_3$ ✓substitution into correct formula/ *vervanging in korrekte formule* ✓correct use of logs/ *korrekte gebruik van logs* ✓answer/*antwoord* (4)
		[11]
QUESTION 4/ *VRAAG 4*		
4.1.1	*y*-intercept: make $x = 0$ *y*-afsnit: stel $x = 0$ $\therefore y = \frac{2}{0+1} - 3$ $y = -1$ $\therefore (0 ; -1)$ **NOTE: Must be in coordinate form.** **Answer only: full marks/** ***LET WEL: Moet in koördinaatvorm wees.*** ***Antwoord alleenlik: volpunte***	✓answer/*antwoord* (1)

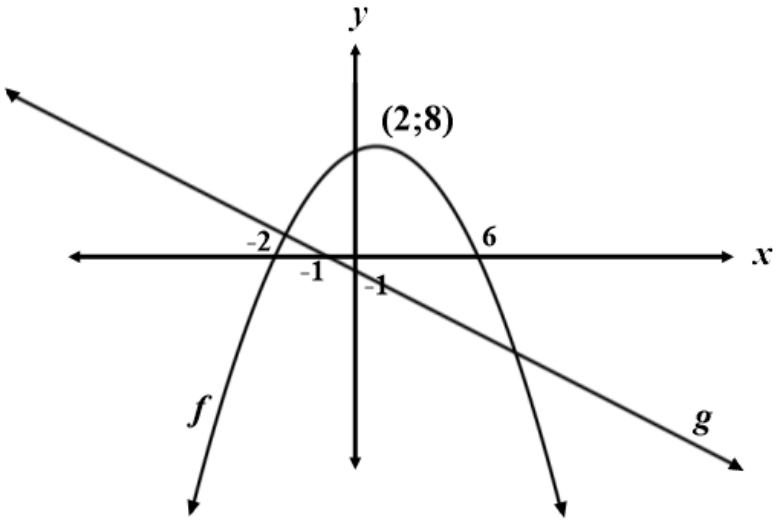
4.1.2	*x*-intercept: make $y = 0$/ *x-afsnit: stel y = 0* $0 = \frac{2}{x+1} - 3$ $3 = \frac{2}{x+1}$ $3(x+1) = 2$ $3x + 3 = 2$ $3x = -1$ $x = -\frac{1}{3}$ $(-\frac{1}{3};\ 0)$ **NOTE: Answer does not need to be in coordinate form.** ***LET WEL: Antwoord hoef nie in koördinaatvorm te wees nie.***	✓valid simplification/ *geldige vereenvoudiging* (either lines 3, 4 or 5/ *óf lyne 3, 4 óf 5*) ✓answer/*antwoord* (2)
4.1.3		✓shape/*vorm* ✓asymptotes/*asimptotes* ✓*x*-inter/*afsnit*. $(-\frac{1}{3}; 0)$ and/*en* *y*- inter/*afsnit* (0 ; –1) (3)

4.1.4	$y = ax + q$ $-3 = -(-1) + q$ $q = -4$ $\therefore y = -x - 4$ **OR/*OF*** $y - y_1 = m(x - x_1)$ $y - (-3) = -1(x - (-1))$ $y + 3 = -(x + 1)$ $y + 3 = -x - 1$ $y = -x - 4$ **OR/*OF*** $y = -(x + 1) - 3$ $y = -x - 1 - 3$ $y = -x - 4$	✓substitute/*vervang* $m = -1$ and point/*en punt* $(-1 ; -3)$ ✓answer/*antwoord* **OR/*OF*** ✓substitute/*vervang* $m = -1$ and point/*en punt* $(-1 ; -3)$ ✓answer/*antwoord* **OR/*OF*** ✓substitute/*vervang* $m = -1$ and point/*en punt* $(-1 ; -3)$ ✓answer/*antwoord* (2)
4.2.1	C(1 ; 0)	✓answer/*antwoord* (1)
4.2.2	Range/*waardeversameling*: $y \in R$ **OR/*OF*** $y \in (-\infty; \infty)$	✓answer/*antwoord* (1)
4.2.3	$y = log_a x$ $-1 = log_a 5$ $a^{-1} = 5$ $a = \frac{1}{5}$	✓correct log equation to exponential equation/ *korrekte log vergelyking na eksponensiële vergelyking* ✓answer/*antwoord* (2)
4.2.4	t: $y = \log_{\frac{1}{5}} x$ h: $x = \log_{\frac{1}{5}} y$ $y = \left(\frac{1}{5}\right)^x$ **OR/*OF*** $y = 5^{-x}$	✓interchange x and y/ *ruil x en y om* ✓answer/*antwoord* (2)

4.2.5	$x \in R$ **OR/*OF*** $x \in (-\infty;\infty)$	✓answer/*antwoord* **OR/*OF*** ✓answer/*antwoord* (1)
4.2.6	$y = 0$	✓answer/*antwoord* (1)
		[16]
QUESTION 5/ ***VRAAG 5***		
5.1	$f(x) = -ax^2 + bx + 6$ $f'(x) = -2ax + b$ $f'(-1) = -2a(-1) + b$ $f'(-1) = 2a + b$ $3 - 2a = b \quad ...(1)$	✓derivative/*afgeleide* ✓equation/*vergelyking* (1)
	$f(x) = -ax^2 + bx + 6$ $\frac{7}{2} = -a(-1)^2 + b(-1) + 6$ $\frac{7}{2} = -a - b + 6$ $b = -a + \frac{5}{2} \quad ... (2)$	✓equation/*vergelyking* (2)
	(1) = (2) $3 - 2a = -a + \frac{5}{2}$ $a = \frac{1}{2}$ $\therefore \quad b = 3 - 2\left(\frac{1}{2}\right)$ $b = 2$	✓equating/*gelykstel* ✓substitution of *a*-value in any correct equation for *b*/*vervanging van a-waarde in enige korrekte vergelyking om b te bepaal*
	OR/*OF*	**OR/*OF***

	$f(x) = -ax^2 + bx + 6$ $f'(x) = -2ax + b$ $f'(-1) = -2a(-1) + b$ $\therefore \quad 3 = 2a + b \quad$ ……..(1) $f(x) = -ax^2 + bx + 6$ $(-1 ; \frac{7}{2})$: $\frac{7}{2} = -a(-1)^2 + b(-1) + 6$ $\frac{7}{2} - 6 = -a - b$ $-\frac{5}{2} = -a - b$……..(2) (1) + (2): $a = \frac{1}{2}$ ……(3) (3) in (1): $3 = 2(\frac{1}{2}) + b$ $3 = 1 + b$ $b = 2$	✓derivative/*afgeleide* ✓equation/*vergelyking* (1) ✓equation/*vergelyking* (2) ✓method to determine *a/ metode om a te bepaal* ✓substitution of *a*-value in correct equation for *b/ vervanging van a-waarde in korrekte vergelyking om b te bepaal* (5)
5.2	$f(x) = -\frac{1}{2}x^2 + 2x + 6$ $x-$intercepts/*afsnit* $\therefore f(x) = 0$ $0 = -\frac{1}{2}x^2 + 2x + 6$ $0 = x^2 - 4x - 12$ $0 = (x-6)(x+2)$ $\therefore \quad x = 6$ or/*of* $x = -2$ $(6;0)$ or/*of* $(-2;0)$ **NOTE: Answer does not have to be in coordinate form./** ***LET WEL: Antwoord hoef nie in koördinaatvorm te wees nie***	✓factors/*faktore* ✓answers/*antwoorde* (2)

5.3	$f(x) = -\frac{1}{2}x^2 + 2x + 6$ $f'(x) = -x + 2$ $0 = -x + 2$ $x = 2$ $f(2) = -\frac{1}{2}(2)^2 + 2(2) + 6$ $f(2) = 8$ $\therefore$ TP $(2;8)$ **OR/*OF*** $f(x) = -\frac{1}{2}x^2 + 2x + 6$ $x = \frac{-(2)}{2(-\frac{1}{2})}$ $x = 2$ $f(2) = -\frac{1}{2}(2)^2 + 2(2) + 6$ $f(2) = 8$ TP $(2;8)$ **OR/*OF*** $x = \frac{-2+6}{2}$ $x = 2$ $f(2) = -\frac{1}{2}(2)^2 + 2(2) + 6$ $f(2) = 8$ TP $(2;8)$ **NOTE: Answer does not have to be in coordinate form./** ***LET WEL: Antwoord hoef nie in koördinaatvorm te wees nie***	✓derivative = 0/ a*fgeleide = 0* ✓*x*- value/*x-waarde* ✓*y*- value/*y-waarde* **OR/*OF*** ✓correct subst. into formula/*korrekte vervanging in formule* ✓*x*-value/*x-waarde* ✓*y*- value/*y-waarde* **OR/*OF*** ✓midpoint between *x*-intercepts/*middelpunt tussen x-afsnitte* ✓*x*- value/*x-waarde* ✓*y*-value/*y-waarde* (3)

5.4	 **NOTE: Assessing parabola ONLY./** ***LET WEL: Assesseer ALLEENLIK parabool.***	✓intercepts and turning point/*afsnitte en draaipunt* ✓shape/*vorm* (2)
5.5	$0 < x < 4$	✓answer/*antwoord* (1)
5.6	$y = -x - 1$ x – int/afsnit: $0 = -x - 1$ $x = -1$ y – int/afsnit: $y = 0 - 1$ $y = -1$ **NOTE: Mark the sketch combined with Question 5.4. If candidate does NOT sketch the line but calculates *x*- and *y*-intercepts, award 1 mark./** ***LET WEL: Merk die gekombineerde skets by Vraag 5.4. Indien kandidaat NIE die reguitlyn geskets het nie, maar wel die x- en y-afsnitte bereken het, ken 1 punt toe.***	✓*x*-intercept/*x-afsnit* ✓*y*-intercept/*y-afsnit* (2)
5.7	$f(x).g(x) \leq 0$ $\therefore x \leq -2$ or/*of* $-1 \leq x \leq 6$ **NOTE: Accuracy marks. Candidate may write answers as separate inequalities./** ***LET WEL: Akkuraatheid punte. Kandidaat mag die antwoord skryf as aparte ongelykhede.***	✓answer/*antwoord* ✓answer/*antwoord* (2)
		[17]

QUESTION 6 ***VRAAG 6***		
6.1.1	$\frac{10\%}{4}$ $= 2,5\%$	✓answer/*antwoord* (1)
6.1.2	$A = P(1 + i)^n$ $A = \text{R}5\,000\left(1+\frac{0.1}{4}\right)^8$ $A = \text{R}6\,092,01$ **OR/*OF*** $A = P(1 + i)^n$ $= \text{R}5\,000(1 + \frac{2,5}{100})^{(2 \text{ x } 4)}$ $\approx \text{R}6\,092,01$	✓ $n = 8$ ✓substitution into correct formula/ *vervanging in korrekte formule* ✓answer/*antwoord* **OR/*OF*** ✓ $n = 8$ ✓substitution into correct formula/ *vervanging in korrekte formule* ✓answer/*antwoord* (3)
6.2.1	$Pv = \frac{x[1-(1+i)^{-n}]}{i}$ $800\,000 = \frac{10\,000[1-\left(1+\frac{0,14}{12}\right)^{-n}}{\frac{0,14}{12}}$ $0,67 = \left(1+\frac{0,14}{12}\right)^{-n}$ $\log_{\left(1+\frac{0,14}{12}\right)} 0,066... = -n$ $-n = -233,469...$ $n = 233$ $\therefore$ Sihle can make 233 withdrawals of R10 000 $\therefore$ *Sihle kan* 233 *onttrekkings van* R10 000 *maak* **NOTE: Accept 234 withdrawals./** ***LET WEL: Aanvaar 234 onttrekkings.***	✓ $i = \frac{0,14}{12}$ ✓correct subst. in correct formula/*korrekte vervanging in korrekte formule* ✓simplification/*vereen-voudiging* ✓use of logs/*gebruik van logs* ✓answer/*antwoord* (5)

6.2.2(a)	$A = P(1 + i)^n$ $A = \text{R}8\,000\,000\left(1+\frac{0.14}{12}\right)^{48}$ A = R1 396 005,54 $Fv = \frac{x[(1+i)^n - 1]}{i}$ $Fv = \frac{\text{R}10\,000[(1+\frac{0,14}{12})^{48} - 1]}{\frac{0,14}{12}}$ Fv = R638 577,36 Remaining money/*Oorblywende geld* = $A - Fv$ R1 396 005,54 – R638 577,36 = R757 428,18 Sihle's deposit is/*Sihle se deposito is* R757 428	✓answer/*antwoord* (A) ✓substitution into correct formula/ *vervanging in korrekte formule* ✓answer/*antwoord* (Fv) ✓answer/*antwoord* (4)
6.2.2(b)	Let purchase price = x/ *Gestel die aankoopprys* = x 30 % × x = R757 428 x = R2 524 760	 ✓answer/*antwoord* (1)
		[14]

QUESTION 7
VRAAG 7

7.1.1	$f(x)=1-4x^2$ $f(x+h)=1-4(x+h)^2$ $=1-4(x^2+2xh+h^2)$ $=1-4x^2-8xh-4h^2$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim_{h\to 0}\frac{1-4x^2-8xh-4h^2-(1-4x)^2}{h}$ $=\lim_{h\to 0}\frac{1-4x^2-8xh-4h^2-1+4x^2}{h}$ $=\lim_{h\to 0}\frac{-8xh-4h^2}{h}$ $=\lim_{h\to 0}\frac{h(-8x-4h)}{h}$ $=\lim_{h\to 0}-8x-4h$ $=-8x$	✓ $f(x+h)$ ✓simplification/ *vereenvoudiging* ✓common factor/ *gemeenskaplike faktor* ✓answer/*antwoord* (4)
7.1.2	$f'(x)=-8x$ $f'(2)=-8(2)$ $f'(2)=-16$	✓substitution/ *vervanging* ✓answer/*antwoord* (2)
7.2	$f(x)=\sqrt[3]{x^2}+\frac{1}{4x^4}$ $f(x)=x^{\frac{2}{3}}+\frac{1}{4}x^{-4}$ $f'(x)=\frac{2}{3}x^{-\frac{1}{3}}-x^{-5}$	✓simplification/ *vereenvoudiging* ✓ $\frac{2}{3}x^{-\frac{1}{3}}$ ✓ $-x^{-5}$ (3)

7.3	$h'(x) = 2ax$ $h'(4) = 8a$ $y = ax^2 \quad ; \quad x > 0$ $\therefore$ inverse/*omgekeerde* $x = ay^2 \quad ; \quad y > 0$ $y = \sqrt{\frac{x}{a}}$ $h^{-1}(8) = \sqrt{\frac{8}{a}}$ $\therefore \sqrt{\frac{8}{a}} = 8a$ $\frac{8}{a} = 64a^2$ $\frac{1}{8} = a^3$ $a = \frac{1}{2}$	✓derivative/*afgeleide* ✓ $h'(4) = 8a$ ✓ $h^{-1}(x) = \sqrt{\frac{8}{a}}$ ✓equating/*gelykstel* ✓simplification/ *vereenvoudiging* ✓answer/*antwoord* (6)
		[15]

QUESTION 8 ***VRAAG 8***		
8.1	$g(x) = x^3 - 3x^2$ $g'(x) = 3x^2 - 6x$ $g''(x) = 6x - 6$ $g''(x) = 0$ $\therefore 6x - 6 = 0$ $\therefore x = 1$ $\therefore g(1) = -2$ point of inflection/*infleksiepunt* : (1; -2) $h(x) = -\frac{2}{3}x - \frac{4}{3}$ $h(1) = -2$ The graph of *h* **DOES INTERSECT** with the point of inflection of *g./Die grafiek van h **SNY** die grafiek van g by die infleksiepunt.* **NOTE: The conclusion mark can only be awarded if the candidate supports this with an appropriate calculation./** ***LET WEL: Die punt vir die gevolgtrekking kan alleenlik toegeken word indien die kandidaat dit ondersteun met die nodige berekeninge.***	✓1st derivative/ 1*ste afgeleide* ✓2nd derivative/ 2*de afgeleide* ✓ $x = 1$ ✓ $g(1) = -2$ ✓ $h(1) = -2$ ✓conclusion/ *gevolgtrekking* (6)
8.2	$y = g'(x) = 3x^2 - 6x$ $\frac{dy}{dx} = 0 \quad \therefore 6x - 6 = 0$ $x = 1$ $g'(1) = 3(1)^2 - 6(1)$ $g'(1) = -3$ $\therefore (1 ; -3)$ $y = 3x^2 - 6x$ is a positive parabola/*is 'n positiewe parabool* $\therefore$ TP(1; –3) is a MINIMUM/*is 'n MINIMUM*	✓derivative = 0/ *afgeleide = 0* ✓value of *x/waarde van x* ✓value of *y/waarde van y* ✓conclusion / g*evolgtrekking* (4)

8.3.1	$g(x) = x^3 - 3x^2$ $g''(x) = 6x - 6$ $g''(x) < 0$ $\therefore 6x - 6 < 0$ $\therefore \quad x < 1$	✓answer/*antwoord* (1)
8.3.2	Point of inflection/*Infleksiepunt* $g''(x) = 0$ $\therefore x = 1$ $m = g'(x) = 3x^2 - 6x$ $g'(1) = 3(1)^2 - 6(1)$ $g'(1) = 3(1)^2 - 6(1)$ $g'(1) = -3$ $\therefore m = -3$ $\therefore$ the gradient of the point of inflection is –3 $\therefore$ *die gradiënt van die infleksiepunt is –3*	✓substitution/ *vervanging* ✓answer/*antwoord* (2)
8.3.3	$g'(x) = 3x^2 - 6x$ $= 3(x^2 - 2x)$ $= 3(x^2 - 2x + 1 - 1)$ $= 3(x - 1)^2 - 3$ $g'(x)$ has a minimum value of –3. The student is correct./ *g′(x) het 'n minimum waarde van –3.* *Die student is korrek* **OR/*OF*** $g'(x) = 3x^2 - 6x$ $g''(x) = 6x - 6$ $0 = 6x - 6$ $x = 1$ $g'(1) = 3(1)^2 - 6(1)$ $g'(1) = -3$ $g'(x)$ has a minimum value of –3/ *g′(x) het 'n minimum waarde van –3.* The student is correct./ *Die student is korrek.* **NOTE: The conclusion mark can only be awarded if the candidate supports this with an appropriate calculation./** ***LET WEL: Die punt vir die gevolgtrekking kan alleenlik toegeken word indien die kandidaat dit ondersteun met die nodige berekeninge.***	✓writing $g'(x)$ in terms of/*skryf* $g'(x)$ *in terme van* $y = a(x-p)^2 + q$ ✓conclusion/*gevolgtrekking* **OR/*OF*** ✓calculate pt/*bereken punt*.(1 ; –3) ✓conclusion/*gevolgtrekking* (2)

8.4	g decreases when $m = g'(x) < 0$ *g neem af wanneer* $m = g'(x) < 0$ $\therefore 3x^2 - 6x < 0$ $3x(x-2) < 0$ $0 < x < 2$ If p decreases between -3 and -1 *Indien p afneem tussen* -3 *en* -1 $p(x) = g(x+k) = (x+k)^3 - 3(x+k)^2$ $\therefore$ g moves 3 units to the left $\therefore$ *g skuif* 3 *eenhede na links* $\therefore k = 3$	✓ $3x^2 - 6x < 0$ ✓ $0 < x < 2$ ✓deduction where p decreases/*afleiding waar p afneem* ✓answer/*antwoord* (4)
		[19]

QUESTION 9
VRAAG 9

9.1	$\pi r^2 h = 6$ $h = \frac{6}{\pi r^2}$	✓answer/*antwoord* (1)
9.2	$S = 10(2\pi r^2 + 2\pi rh) + 10(4\pi r^2)$ $= 10\left(2\pi r^2 + 2\pi rh + 4\pi r^2\right)$ $= 10\left(6\pi r^2 + 2\pi rh\right)$ $= 60\pi r^2 + 20\pi r.\frac{6}{\pi r^2}$ $= 60\pi r^2 + \frac{120}{r}$ **OR/*OF*** $S = 10(2\pi r^2 + 2\pi r + 4\pi r^2)$ $= 10(2\pi rh + 6\pi r^2)$ $= 20\pi rh + 60\pi r^2$ $= 20\pi r\left(\frac{6}{\pi r^2}\right) + 60\pi r^2$ $= 60\pi r^2 + \frac{120}{r}$	✓area of 10 spheres/*oppv. van 10 sferes* ✓area of 10 cylinders/ *oppv. van 10 silinders* ✓simplification/*vereenvoudiging* ✓substitution *h/vervang h* **OR/*OF*** ✓✓combined areas of spheres and cylinders/ *gekombineerde oppervlaktes van sferes en silinders* ✓simplification/*vereenvoudiging* ✓substitution *h/vervang h* (4)
9.3	$S' = 120\pi r - 120r^{-2}$ $120\pi r - \frac{120}{r^2} = 0$ $120\pi r^3 - 120 = 0$ $r^3 = \frac{120}{120\pi}$ $r = \frac{1}{\pi^{\frac{1}{3}}}$ $= 0,68cm$ **NOTE: Derivative = 0 must be stated NOT implied./** ***LET WEL: Afgeleide = 0 moet aangedui word en nie net geïmpliseer word nie.***	✓derivative = 0/*afgeleide = 0* ✓ r^3 as subject/ r^3 *as onderwerp* ✓answer/*antwoord* (3)
		[8]

QUESTION 10 ***VRAAG 10***		
10.1	$P(A \cap B) \neq 0$ $\therefore$ NO, A and B are NOT mutually exclusive *$\therefore$ NEE, A en B is NIE onderling uitsluitend nie* **NOTE: Candidate concludes ONLY, award 0 marks./** ***LET WEL: Indien kandidaat SLEGS afleiding gee, gee 0 punte.***	✓ $P(A \cap B) \neq 0$ ✓conclusion/*gevolgtrekking* (2)
10.2	$P(A \cup B)=P(A) + P(B) - P(A \cap B)$ $P(A \cup B) = 0,38 + 0,42 - 0,1596$ $P(A \cup B) = 0,6404$ $P(A \cup B) = 0,64$	✓formula/*formule* **OR/*OF*** ✓correct substitution/*korrekte vervanging* (1)
10.3	$0,38 \times n(S) = 456$ $\therefore n(S) = \frac{456}{0,38}$ $\therefore n(S) = 1200$	✓setting up any valid equation for *n*(S)/*stel enige geldige vergelyking op vir n(S)* ✓answer/*antwoord* (2)
10.4	$P(C') = 1 - P(C)$ $P(C') = 1 - 0,28$ $P(C') = 0,72$ $n(C') = 0,72 \times n(S)$ $n(C') = 0,72 \times 1200$ $n(C') = 864$	✓$P(C')$ ✓answer/*antwoord* (2)
		[7]

QUESTION 11 ***VRAAG 11***		
11.1.1	If repeated digits are considered **IDENTICAL**(i.e., treated as ONE digit):/*Indien getalle herhaal word, word dit as* ***IDENTIES*** *gereken (m.a.w word dit as EEN getal gereken):* $1\times\ 4!\ \times 1$ $= 4!$ $= 24$ ways/*moontlikhede* **OR/*OF*** If repeated digits are **NOT** considered identical:/*Indien herhalende getalle* ***NIE*** *as identies gereken word* ***NIE****:* $2!\times 4!$ $= 2 \times 24$ $= 48$ ways/*moontlikhede*	✓4! or/*of* 24 ways/*moontlikhede* **OR/*OF*** ✓2!.4! or/*of* 48 ways/*moontlikhede* (1)
11.1.2	If repeated digits are considered **IDENTICAL:/** *Indien herhalende getalle as* ***IDENTIES*** *gereken word:* Total number of 6-digit numbers/ *Totale aantal 6-getal nommers* $= \frac{6!}{2!}$ $= 360$ $P(112347 \text{ or } 743211) = \frac{2}{360}$ $= \frac{1}{180}$ or/*of* 0,01 **OR/*OF*** If repeated digits are **NOT** considered identical:/ *Indien herhalende getalle* ***NIE*** *as identies gereken word* ***NIE****:* Total number of 6-digit numbers *Totale aantal* 6*-getal nommers* $= 6!$ $= 720$ $P(112347 \text{ or } 743211) = \frac{4}{720}$ $= \frac{1}{180}$ or/*of* 0,01	✓$\frac{6!}{2!}$ ✓360 ✓$\frac{2}{360}$ ✓answer/*antwoord* **OR/*OF*** ✓6! ✓720 ✓$\frac{4}{720}$ ✓answer/*antwoord* (4)

11.2	Total number of arrangements of n people = $n!$/ *Totale aantal rangskikkings van n persone = n!* Number of arrangements of persons 1 and 2 = 2!/ *Aantal rangskikkings van persone 1 en 2 = 2!* $\therefore$ Number of arrangements of n people if 1 and 2 are grouped/ $\therefore$*Aantal rangskikkings van n persone indien 1 en 2 saam gegroepeer word:* $= (n-1)!$ $\therefore 2! \times (n-1)!$ Number of ways that 1 and 2 are NOT next to each other/ *Aantal maniere wat 1 en 2 NIE langs mekaar staan* ***NIE*** $\therefore n! - 2!(n-1)!$	✓$n!$ ✓$2!(n\text{-}1)!$ ✓answer/*antwoord* (3)
		[8]
		TOTAL: 150 ***TOTAAL: 150***