basic education

Department:
Basic Education
**REPUBLIC OF SOUTH AFRICA**

# NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

## GRADE 12/*GRAAD 12*

## MATHEMATICS P1/*WISKUNDE V1*

## NOVEMBER 2022

## MARKING GUIDELINES/*NASIENRIGLYNE*

**MARKS/*PUNTE*: 150**

Stanmorephysics

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

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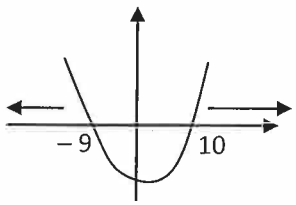
**NOTE:**

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent Accuracy applies in all aspects of the marking guidelines.

**LET WEL:**

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.*
- *Volgehoue akkuraatheid is DEURGAANS op ALLE aspekte van die nasienriglyne van toepassing.*

**QUESTION1/*VRAAG* 1**

| | | |
|---|---|---|
| 1.1.1 | $(3x-6)(x+2)=0$<br>$x=2$ or $x=-2$ | ✓ $x=2$<br>✓ $x=-2$ (2) |
| 1.1.2 | $2x^2-6x+1=0$<br>$x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$<br>$x=\dfrac{6\pm\sqrt{(-6)^2-4(2)(1)}}{2(2)}$<br>$x=2{,}82$ or $x=0{,}18$ | ✓ correct substitution into correct formula<br>✓ 2,82<br>✓ 0,18 (3) |
| 1.1.3 | $x^2-90>x$<br>$x^2-x-90>0$<br>$(x+9)(x-10)>0$<br>CV: $x=-9$ or $x=10$<br><br><br>$x<-9$ or $x>10$<br>**OR/OF**<br>$(-\infty;-9)$ or $(10;\infty)$ | ✓ standard form<br>✓ critical values<br>✓✓ $x<-9$ or $x>10$ (4) |

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| | | |
|---|---|---|
| 1.1.4 | $x-7\sqrt{x}=-12$<br>$x+12=7\sqrt{x}$<br>$(x+12)^2=(7\sqrt{x})^2$<br>$x^2+24x+144=49x$<br>$x^2-25x+144=0$<br>$(x-16)(x-9)=0$<br>$x=16$ or $x=9$<br>**OR/*OF***<br>$x-7\sqrt{x}+12=0$<br>$(\sqrt{x}-3)(\sqrt{x}-4)=0$ or let $\sqrt{x}=k$<br>$\sqrt{x}=3$ or $\sqrt{x}=4$<br>$x=9$ or $x=16$ | ✓ isolating the root<br>✓ squaring both sides<br>✓ standard form<br>✓ both answers (4)<br>**OR/*OF***<br>✓ standard form<br>✓ factors<br>✓ answers<br>✓ both answers for $x$ (4) |
| 1.2 | $2x-y=2$<br>$y=2x-2$ .....( 1 )<br>$xy=4$ .....( 2 )<br>(1) in (2):<br>$x(2x-2)=4$<br>$2x^2-2x-4=0$<br>$x^2-x-2=0$<br>$(x-2)(x+1)=0$<br>$x=2$ or $x=-1$<br>$y=2$ $y=-4$ | ✓ eq 1<br>✓ substitution<br>✓ standard form<br>✓ $x$-values<br>✓ $y$-values (5) |

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| | | |
|---|---|---|
| | **OR/*OF*** | **OR/*OF*** |
| | $2x-y=2$ | |
| | $x=\frac{1}{2}y+1$ .....( 1 ) | ✓ eq 1 |
| | $xy=4$ .....( 2 ) | |
| | (1) in (2): | |
| | $y\left(\frac{1}{2}y+1\right)=4$ | ✓ substitution |
| | $\frac{1}{2}y^2+y-4=0$ | ✓ standard form |
| | $y^2+2y-8=0$ | |
| | $(y+4)(y-2)=0$ | |
| | $y=-4$ or $y=2$ | ✓ $y$-values |
| | $x=-1$ $x=2$ | ✓ $x$-values (5) |
| | **OR/OF** | **OR/OF** |
| | $2x-y=2$ .....( 1 ) | |
| | $y=\frac{4}{x}$ .....( 2 ) | ✓ eq 2 |
| | (2) in (1): | |
| | $2x-\frac{4}{x}=2$ | ✓ substitution |
| | $2x^2-2x-4=0$ | ✓ standard form |
| | $x^2-x-2=0$ | |
| | $(x-2)(x+1)=0$ | |
| | $x=2$ or $x=-1$<br>$y=2$ $y=-4$ | ✓ $x$-values<br>✓ $y$-values (5) |

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| | | |
|---|---|---|
| | **OR/OF**<br>$2x-y=2$ .....( 1 )<br>$x=\frac{4}{y}$ .....( 2 )<br>(2)in (1):<br>$2\left(\frac{4}{y}\right)-y=2$<br>$8-y^2-2y=0$<br>$y^2+2y-8=0$<br>$(y+4)(y-2)=0$<br>$y=-4$ or $y=2$<br>$x=-1$ $x=2$ | **OR/OF**<br>✓ eq 2<br>✓ substitution<br>✓ standard form<br>✓ $y$-values<br>✓ $x$-values (5) |
| 1.3 | $2.5^n-5^{n+1}+5^{n+2}=2.5^n-5^n.5^1+5^n.5^2$<br>$=5^n(2-5+25)$<br>$=5^n(22)$<br>$2(5^n(11))$<br>**OR/OF**<br>Any integer multiplied by an even number will be even | ✓ exp law<br>✓common factor<br>✓answer/explanation (3) |
| 1.4 | $\frac{3^{y+1}}{32}=\sqrt{96^x}$<br>$\frac{3^{y+1}}{2^5}=(96)^{\frac{x}{2}}$<br>$3^{y+1}.2^{-5}=2^{\frac{5x}{2}}.3^{\frac{x}{2}}$<br>$-5=\frac{5x}{2}$<br>$\therefore x=-2$<br>$y+1=\frac{x}{2}$<br>$y+1=\frac{-2}{2}$<br>$\therefore y=-2$ | ✓ $\frac{3^{y+1}}{2^5}=(96)^{\frac{x}{2}}$<br>✓ $3^{y+1}.2^{-5}=2^{\frac{5x}{2}}.3^{\frac{x}{2}}$<br>✓ $x=-2$<br>✓ $y=-2$ (4) |

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|---|---|---|
| | **OR/OF**<br>$\frac{3^{y+1}}{32} = \sqrt{96^x}$<br>$\left(\frac{3^{y+1}}{2^5}\right)^2 = \left(\sqrt{(96)^x}\right)^2$<br>$\frac{3^{2y+2}}{2^{10}} = 2^{5x}.3^x$<br>$3^{2y+2}.2^{-10} = 2^{5x}.3^x$<br><br>$-10 = 5x$<br>$\therefore x = -2$<br><br>$2y+2 = -2$<br>$\therefore y = -2$ | **OR/OF**<br><br>✓ $\left(\frac{3^{y+1}}{2^5}\right)^2 = \left(\sqrt{(96)^x}\right)^2$<br><br>✓ $3^{2y+2}.2^{-10} = 2^{5x}.3^x$<br><br>✓ $x = -2$<br><br>✓ $y = -2$ (4) |
| | | **[25]** |

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**QUESTION 2/*VRAAG 2***

| | | |
|---|---|---|
| 2.1.1 | $a=14$<br>$T_6=14r^5=448$<br>$r^5=32$<br>$\therefore r=2$<br>Answer only: full marks | ✓ $T_6=14r^5=448$<br>✓ $r=2$ (2) |
| 2.1.2 | $T_n=14(2)^{n-1}$<br>$S_n=\frac{14(2^6-1)}{2-1}$<br>$S_6=882$<br>$114\,674-882=113\,792$<br>$113\,792=896\left(2^n-1\right)$<br>$128=2^n$<br>$n=7$<br>**OR/OF**<br>$S_n=\frac{a(r^n-1)}{r-1}$<br>$114\,674=\frac{14(2^n-1)}{2-1}$<br>$8191=2^n-1$<br>$2^n=8192$<br>$n=\log_2 8192$<br>$n=13$<br>$\therefore$ 7 more terms must be added to the first 6 terms. | ✓ substitution into correct formula<br>✓ $S_6=882$<br>✓ $128=2^n$<br>✓ 7 (4)<br>**OR/OF**<br>✓ substitution into correct formula<br>✓ $2^n=8192$<br>✓ $n=13$<br>✓ 7 (4) |
| 2.1.3 | $r=\frac{1}{2}$ OR $448r^5=14$<br>$\therefore r=\frac{1}{2}$<br>$S_\infty=\frac{a}{1-r}$<br>$S_\infty=\frac{448}{1-\frac{1}{2}}$<br>$S_\infty=896$ | ✓ $r=\frac{1}{2}$<br>✓ substitution<br>✓ answer (3) |

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| | | |
|---|---|---|
| 2.2 | $\sum_{p=0}^{k}\left(\frac{1}{3}p+\frac{1}{6}\right)=20\frac{1}{6}$ | |
| | $T_1=\frac{1}{6}\qquad T_2=\frac{1}{3}+\frac{1}{6}=\frac{3}{6}$ | ✓ $T_1=\frac{1}{6}$ |
| | $d=\frac{3}{6}-\frac{1}{6}=\frac{1}{3}$ | ✓ $d$ |
| | $\frac{121}{6}=\frac{n}{2}\left[2\left(\frac{1}{6}\right)+(n-1)\left(\frac{1}{3}\right)\right]$ | ✓ substitution |
| | $\frac{121}{3}=n\left[\frac{1}{3}+\frac{1}{3}n-\frac{1}{3}\right]$ | |
| | $\frac{121}{3}=\frac{1}{3}n^2$<br>$121=n^2$ | |
| | $n=11$<br>$\therefore k=10$ | ✓ value of $n$<br>✓ value of $k$ (5) |
| | **OR/*OF*** | **OR/*OF*** |
| | $\sum_{p=0}^{k}\left(\frac{1}{3}p+\frac{1}{6}\right)=20\frac{1}{6}$ | |
| | $a=\frac{1}{6}$ | ✓ $a=\frac{1}{6}$ |
| | $l=\frac{1}{3}k+\frac{1}{6}$ | ✓ $l$ |
| | $n=k+1$ | ✓ $n=k+1$ |
| | $S_n=\frac{n}{2}[a+l]$ | |
| | $\frac{121}{6}=\frac{k+1}{2}\left[\frac{1}{6}+\frac{1}{3}k+\frac{1}{6}\right]$ | |
| | $\frac{121}{6}=\frac{k+1}{2}\left[\frac{1}{3}k+\frac{1}{3}\right]$ | |
| | $\frac{121}{6}=\frac{k+1}{2}\left[\frac{k+1}{3}\right]$ | |
| | $\frac{121}{6}=\frac{(k+1)^2}{6}$ | ✓ $\frac{121}{6}=\frac{(k+1)^2}{6}$ |
| | $k+1=\pm\sqrt{121}$<br>$k+1=11$<br>$k=10$ | ✓ value of $k$ (5) |
| | | **[14]** |

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**QUESTION 3/*VRAAG 3***

| | | |
|---|---|---|
| 3.1 | $3a+b=7$<br>$3+b=7$<br>$b=4$<br><br>**OR/OF**<br>$T_2-T_1=7$<br>$4+2b+9-(1+b+9)=7$<br>$b=4$ | ✓ $3a+b=7$<br>✓ $3+b=7$ (2)<br><br>**OR/OF**<br>✓ $T_2-T_1=7$<br>✓ substitution (2) |
| 3.2 | $T_n=n^2+4n+9$<br>$T_{60}=(60)^2+4(60)+9$<br>$=3849$ Answer only: full marks | ✓ substitution<br>✓ answer (2) |
| 3.3 | 14 ; 21 ; 30 ; 41;<br>First difference: 7 ; 9 ; 11 ; …<br>Common 2nd difference: 2<br><br>$T_p=2p+5$ Answer only: full marks<br><br>**OR/*OF***<br>First difference: 7 ; 9 ; 11 ; …<br>$T_n=a+(n-1)d$<br>$T_p=7+(p-1)(2)$<br>$T_p=2p+5$ | ✓first difference<br>✓ 2<br><br>✓ $2p+5$ (3)<br><br>**OR/*OF***<br>✓first difference<br><br>✓ 2<br><br>✓ $2p+5$ (3) |
| 3.4 | $157=2p+5$<br>$p=76$<br>∴ Between $T_{76}$ and $T_{77}$<br><br>**OR/OF**<br><br>$T_{n+1}-T_n=157$<br>$(n+1)^2+4(n+1)+9-(n^2+4n+9)=157$<br>$n^2+2n+1+4n+4+9-n^2-4n-9=157$<br>$2n=152$<br>$n=76$<br>∴ Between $T_{76}$ and $T_{77}$ | ✓ $157=2p+5$<br>✓ $p=76$<br>✓ $T_{76}$ and $T_{77}$ (3)<br><br>**OR/OF**<br><br>✓ $T_{n+1}-T_n=157$<br><br><br><br>✓ $n=76$<br>✓ $T_{76}$ and $T_{77}$ (3) |
| | | **[10]** |

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**QUESTION 4/*VRAAG* 4**

| | | |
|---|---|---|
| 4.1.1 | $p=-1$ and $q=2$ | ✓ $p=-1$ ✓ $q=2$ (2) |
| 4.1.2 | $\frac{1}{x-1}+2=0$<br>$-2x+2=1$<br>$x=\frac{1}{2}$<br>$\left(\frac{1}{2};0\right)$ | ✓ $=0$<br><br><br><br>✓ answer (2) |
| 4.1.3 | $x=\frac{1}{2}-3$<br>$=\frac{-5}{2}$ Answer only: full marks | ✓ $-3$<br>✓ $x=\frac{-5}{2}$ (2) |
| 4.1.4 | $y=x+t$<br>$2=1+t$<br>$t=1$ | ✓subst (1 ; 2)<br>✓ $t=1$ (2) |
| 4.1.5 | $-2\le\frac{1}{x-1}$ Answer only: full marks<br><br>$\frac{1}{x-1}+2\ge 0$<br><br>$\therefore x\le\frac{1}{2}$ or $x>1$<br>**OR/*OF***<br>$x\in\left(-\infty;\frac{1}{2}\right]$ or $(1;\infty)$ | <br><br>✓ $\frac{1}{x-1}+2\ge 0$<br>✓ $x\le\frac{1}{2}$<br>✓ $x>1$ (3) |
| 4.2.1 | $y=-5$ | ✓ answer (1) |
| 4.2.2 | $x=\frac{-b}{2a}=\frac{-(-4)}{2(1)}=2$<br>$f(2)=2^2-4(2)-5=-9$<br>$\therefore$ D$(2;-9)$<br><br>**OR/*OF***<br>$f'(x)=2x-4$<br>$2x-4=0$<br>$x=2$<br>$f(2)=2^2-4(2)-5=-9$<br>$\therefore$ D$(2;-9)$ | ✓ $x=2$<br>✓ $y=-9$ (2)<br><br>**OR/*OF***<br><br><br>✓ $x=2$<br>✓ $y=-9$ (2) |

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| | | |
|---|---|---|
| 4.2.3 | $q=-5$<br>$-9=a(2)^2-5$<br>$-4=4a$<br>$a=-1$<br>$\therefore g(x)=-2^x-5$ | ✓ $q=-5$<br>✓ substitution of $(2\,;-9)$<br>✓ $a=-1$<br>(3) |
| 4.2.4 | $y\in(-\infty\,;-5)$ OR $y<-5; y\in R$ | ✓answer (1) |
| 4.2.5 | $k<-9$ | ✓$-9$<br>✓ $k<-9$ (2) |
| | | **[20]** |

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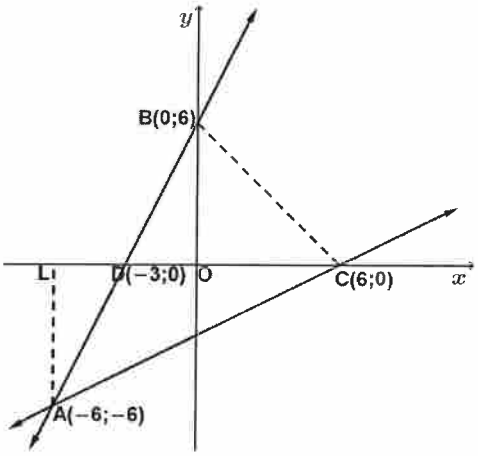
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**QUESTION 5/*VRAAG* 5**

| | | |
|---|---|---|
| 5.1 | $g(x) = 2x + 6$<br>$y = 6$ | ✓ $y = 6$ (1) |
| 5.2 | $y = 2x + 6$<br>$x = 2y + 6$<br>$y = \frac{1}{2}x - 3$<br>Answer only: Full marks | ✓ swop $x$ and $y$<br>✓ equation (2) |
| 5.3 | $\frac{1}{2}x - 3 = 2x + 6$<br>$x - 6 = 4x + 12$<br>$3x = -18$<br>$x = -6$<br>A $(-6 ; -6)$<br>**OR/*OF***<br>$2x + 6 = x$<br>$x = -6$<br>$y = -6$ | ✓equating<br>✓$x = -6$<br>✓ $y = -6$ (3)<br>**OR/*OF***<br>✓equating<br>✓$x = -6$<br>✓$y = -6$ (3) |
| 5.4 | $AB = \sqrt{(6)^2 + (12)^2}$<br>$= \sqrt{180} = 6\sqrt{5} = 13{,}42$ | ✓substitution<br>✓answer (2) |

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|---|---|---|
| 5.5 | $BC = \sqrt{6^2+6^2} = \sqrt{72} = 6\sqrt{2}$<br>$AB = AC = \sqrt{180}$ symmetry of $g$ and $g^{-1}$<br>$\perp h = (\sqrt{180})^2 - \left(\frac{\sqrt{72}}{2}\right)^2$<br>$= \sqrt{162} = 9\sqrt{2}$<br>area of $\Delta ABC = \frac{1}{2} BC \times h$<br>$= \frac{1}{2} \times \sqrt{72} \times \sqrt{162} = 54$ units$^2$<br><br>**OR/*OF***<br>$\tan B\hat{D}C = 2$<br>$\therefore B\hat{D}C = 63{,}43°$<br>$\tan D\hat{C}A = \frac{1}{2}$<br>$\therefore D\hat{C}A = 26{,}57°$<br>$\therefore D\hat{A}C = 36{,}86°$ (ext angle triangle)<br>Area of $\Delta ABC = \frac{1}{2}\left(\sqrt{180}\right)\left(\sqrt{180}\right)\sin 36{,}86°$<br>$= 53{,}99$ units$^2$<br><br>**OR/OF**<br>Area of $\Delta ABC$ = Area of $\Delta BDC$ + Area of $\Delta ADC$<br>$= \frac{1}{2} DC.BO + \frac{1}{2} DC.height$<br>$= \frac{1}{2}(9)(6) + \frac{1}{2}(9)(6)$<br>$= 54$ units$^2$ | ✓ BC<br>✓ AB = AC /midpoint (3 ; 3)<br>✓ $\perp h$ (A)<br>✓ substitution<br>✓ answer (A) (5)<br><br>**OR/*OF***<br>✓ $B\hat{D}C = 63{,}43°$<br>✓ $D\hat{A}C = 36{,}86°$<br>✓ AC = $\sqrt{180}$<br>✓ substitution into the correct formula<br>✓ answer (A) (5)<br><br>**OR/OF**<br>✓ Areas ($\Delta BDC + \Delta ADC$)<br>✓ $\frac{1}{2} DC.BO$<br>✓ $\frac{1}{2} DC.height$<br>✓ substitution<br>✓ answer (A) (5) |
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**QUESTION 6/*VRAAG 6***

| | | |
|---|---|---|
| 6.1 | $A = P(1+i)^n$<br>$13\,459 = 12\,000\left(1+\frac{m}{400}\right)^8$<br>$\left(1+\frac{m}{400}\right)^8 = 1{,}121...$<br>$1+\frac{m}{400} = \sqrt[8]{1{,}121..}$<br>$\frac{m}{400} = 0{,}0144...$<br>$\therefore m = 5{,}78\%$ | ✓ 8<br>✓ subst into correct formula<br>✓ $1+\frac{m}{400} = \sqrt[8]{1{,}121..}$<br>✓ 5,78 %<br>(4) |
| 6.2 | $F = \frac{x\left[(1+i)^n - 1\right]}{i}$<br>$F = \frac{1\,000\left[\left(1+\frac{0{,}075}{12}\right)^{12} - 1\right]}{\frac{0{,}075}{12}}$<br>$= R12\,421{,}22$<br><br>He won't be able to buy the computer because<br>R13 000 – R12 421,22 = R578,78<br>**OR/OF**<br>He won't be able to buy the computer because<br>R12 421,22 < R13 000 | ✓ $\frac{0{,}075}{12}$<br>✓ 12<br>✓ answer<br>✓ conclusion<br>(4) |
| 6.3.1 | Loan amount = 85% × R250 000<br>= R212 500<br><br>**OR/OF**<br>Loan amount = R250 000 – (15% × R250 000)<br>= R212 500 | ✓ answer (1)<br><br>**OR/OF**<br>✓ answer (1) |
| 6.3.2 | $A = 212\,500\left(1+\frac{0{,}13}{12}\right)^5$<br>$A = 224\,262{,}53$<br><br>$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$<br>$224\,262{,}53 = \frac{x\left[1-\left(1+\frac{0{,}13}{12}\right)^{-67}\right]}{\frac{0{,}13}{12}}$<br>$\therefore x = R4\,724{,}96$ | ✓ $A = 212\,500\left(1+\frac{0{,}13}{12}\right)^5$<br>✓answer<br><br>✓ substitution into correct formula<br>✓ – 67<br>✓ answer (5) |
| | | **[14]** |

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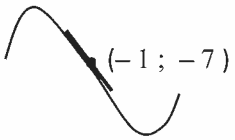
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**QUESTION 7/*VRAAG* 7**
**Notation penalty only in Question 7.1**

| | | |
|---|---|---|
| 7.1 | $f(x)=x^2+x$<br>$f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$<br>$f'(x)=\lim\limits_{h\to 0}\dfrac{(x+h)^2+(x+h)-(x^2+x)}{h}$<br>$f'(x)=\lim\limits_{h\to 0}\dfrac{x^2+2xh+h^2+x+h-x^2-x}{h}$<br>$=\lim\limits_{h\to 0}\dfrac{2xh+h^2+h}{h}$<br>$=\lim\limits_{h\to 0}\dfrac{h(2x+h+1)}{h}$<br>$\therefore f'(x)=2x+1$<br>**OR/*OF***<br>$f(x)=x^2+x$<br>$f(x+h)=(x+h)^2+(x+h)=x^2+2xh+h^2+x+h$<br>$f(x+h)-f(x)=x^2+2xh+h^2+x+h-x^2-x$<br>$=2xh+h^2+h$<br>$f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$<br>$=\lim\limits_{h\to 0}\dfrac{2xh+h^2+h}{h}$<br>$=\lim\limits_{h\to 0}\dfrac{h(2x+h+1)}{h}$<br>$\therefore f'(x)=2x+1$ | ✓substitution into the formula<br>✓ $x^2+2xh+h^2+x+h$<br>✓ $2xh+h^2+h$<br>✓common factor<br>✓answer (5)<br>**OR/*OF***<br>✓ $x^2+2xh+h^2+x+h$<br>✓ $2xh+h^2+h$<br>✓substitution into the formula<br>✓common factor<br>✓answer (5) |
| 7.2 | $f(x)=2x^5-3x^4+8x$<br>$f'(x)=10x^4-12x^3+8$ | ✓ $10x^4$<br>✓ $-12x^3$<br>✓ 8 (3) |
| 7.3 | $g(x)=ax^3+3x^2+bx+c$<br>$g'(x)=3ax^2+6x+b$<br>$g''(x)=6ax+6$<br>$g''(-1)=6a(-1)+6=0$<br>$\therefore a=1$<br>For concave up $g''(x)>0$<br>$6x+6>0$<br>$x>-1$ | ✓ $g'(x)=3ax^2+6x+b$<br>✓<br>$g''(-1)=6a(-1)+6=0$<br>✓ $a=1$<br>✓ $x>-1$ (4) |

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| | | |
|---|---|---|
| | **OR/OF**<br>Min gradient at $(-1\ ;-7)$ implies:<br>at $x=-1$ - point of inflection<br>and $g$ will be positive cubic<br>hence $a>0$<br>Since $g$ is concave up<br>$x>-1$ | **OR/OF**<br>✓ point of inflection<br>✓✓ $a>0$<br>✓ $x>-1$ (4) |
| | **OR/OF**<br><br><br>Since $g$ is concave up<br>$x>-1$ | **OR/OF**<br>✓✓pos graph<br>✓point of inflection<br>✓ $x>-1$ (4) |
| | <br>$(-1\ ;\ y)$<br>Since $g$ is concave up<br>$x>-1$ | |
| | Answer only: $\frac{1}{4}$ | |
| | | **[12]** |

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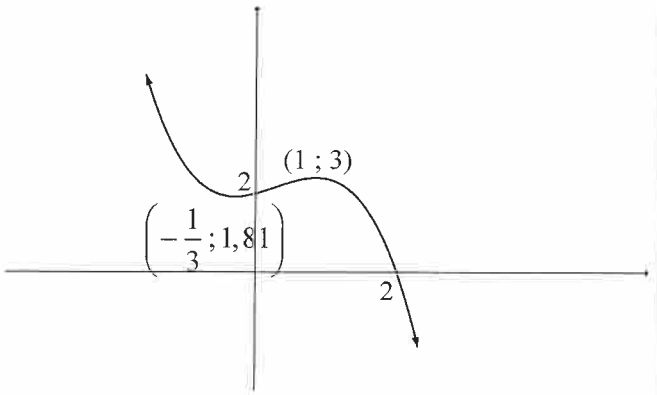
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**QUESTION 8/*VRAAG* 8**

| | | |
|---|---|---|
| 8.1 | $f'(x)=mx^2+nx+k$<br>$f'(x)=m\left(x+\frac{1}{3}\right)(x-1)$<br>$1=m\left(0+\frac{1}{3}\right)(0-1)$<br>$1=-\frac{1}{3}m$<br>$\therefore m=-3$<br>$f'(x)=-3\left(x+\frac{1}{3}\right)(x-1)$<br>$f'(x)=-3\left(x^2-\frac{2}{3}x-\frac{1}{3}\right)$<br>$f'(x)=-3x^2+2x+1$<br>$\therefore n=2$<br>$\therefore k=1$<br><br>**OR/OF**<br>$k=1$<br>$0=m+n+1$ and $\frac{1}{9}m-\frac{1}{3}n+1=0$<br>$m+n=-1$ (1)<br>$m-3n=-9$ (2)<br><br>(1) – (2)<br>$4n=8$<br>$\therefore n=2$<br>$m+2=-1$<br>$\therefore m=-3$ | ✓ substitution of $\left(-\frac{1}{3};0\right)$ and $(1;0)$<br>✓ substitution of $(0;1)$<br><br>✓ $m=-3$<br><br>✓ $f'(x)=-3\left(x^2-\frac{2}{3}x-\frac{1}{3}\right)$<br><br>✓ $n=2$<br>✓ $k=1$ (6)<br><br>**OR/OF**<br>✓ $k=1$<br><br>✓ $m+n=-1$<br>✓ $m-3n=-9$<br><br>✓ $4n=8$<br>✓ $n=2$<br><br>✓ $m=-3$ (6) |
| 8.2.1 | $f(x)=-x^3+x^2+x+2$<br>$f\left(-\frac{1}{3}\right)=\frac{49}{27}=1,81$<br>T.P$\left(-\frac{1}{3};\frac{49}{27}\right)$<br>$f(1)=3$<br>T.P$(1;3)$ | ✓ $x$-coordinates of the TP<br>✓ T.P$\left(-\frac{1}{3};\frac{49}{27}\right)$<br>✓ T.P$(1;3)$ (3) |

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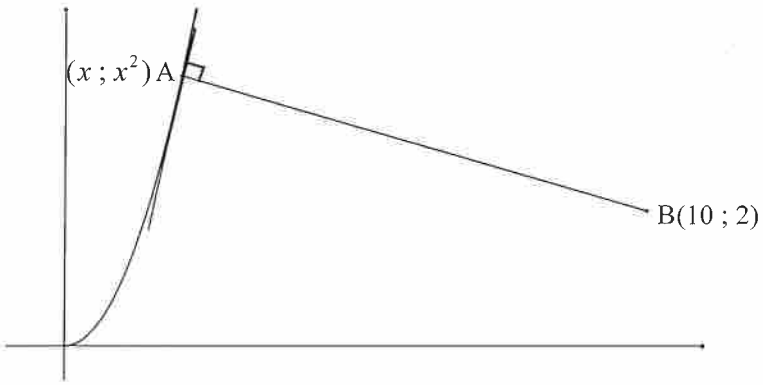
| | | |
|---|---|---|
| 8.2.2 | $f(x)=-x^3+x^2+x+2$<br>$-x^3+x^2+x+2=0$<br>$(x-2)(-x^2-x-1)=0$<br>$x=2$ or no solution<br><br> | ✓ $x=2$<br>✓ one $x$-intercept<br>✓ two turning points<br>✓ $y$-intercept<br>✓ shape: neg cubic (5) |
| 8.3.1 | $a=\dfrac{-\frac{1}{3}+1}{2}$<br>$=\frac{1}{3}$<br>**OR/OF**<br>$f'(x)=-3x^2+2x+1$<br>$f''(x)=-6x+2$<br>$f''(a)=-6a+2=0$<br>$-6a=-2$<br>$a=\frac{1}{3}$ | ✓ answer (1)<br>**OR/OF**<br>✓ answer (1) |
| 8.3.2 | $b<\frac{4}{3}$ units | ✓ $\frac{4}{3}$<br>✓ $b<\frac{4}{3}$ (2) |
| | | **[17]** |

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**QUESTION9/*VRAAG* 9**

| | | |
|---|---|---|
| 9.1 | Any point on $f$ : $(x\,;x^2)$ | ✓$(x\,;x^2)$ |
| | $\text{distance} = \sqrt{(x-10)^2+(x^2-2)^2}$ | ✓ substitution |
| | $= \sqrt{x^2-20x+100+x^4-4x^2+4}$ | ✓ simplification |
| | $= \sqrt{x^4-3x^2-20x+104}$ | ✓ answer |
| | For min distance | |
| | $\frac{d}{dx}\left(x^4-3x^2-20x+104\right)=0$ | |
| | $4x^3-6x-20=0$ | ✓$4x^3-6x-20$ |
| | $(x-2)(4x^2+8x+10)=0$ | ✓ derivative = 0 |
| | $\Delta = 8^2-4(4)(10) = -96 \quad \therefore$ no roots | |
| | $\therefore x = 2$ | ✓$x=2$ |
| | $d = \sqrt{2^4-3(2)^2-20(2)+104} = 2\sqrt{17} = 8{,}25$ | ✓answer (A) (8) |

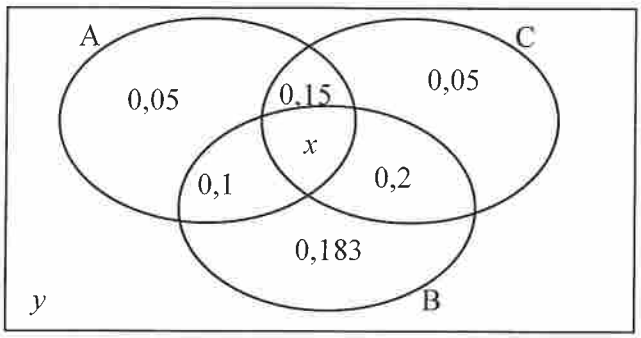



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| | | |
|---|---|---|
| 9.2 | $m_{AB} = \frac{y_2-y_1}{x_2-x_1} = \frac{x^2-2}{x-10}$ | ✓ $m_{AB}$ |
| | $\therefore m_{\tan g} = -\frac{x-10}{x^2-2}$ | ✓ $m_{\tan g} = -\frac{x-10}{x^2-2}$ |
| | $f'(x) = 2x$ | ✓ $f'(x)=2x$ |
| | $\therefore 2x = -\frac{x-10}{x^2-2}$ | ✓ equating |
| | $-2x^3+4x = x-10$ | |
| | $2x^3-3x-10=0$ | ✓ standard form |
| | $x = 2$ | ✓$x=2$ |
| | $y = (2)^2 = 4$ | |
| | $\therefore AB = \sqrt{(2-10)^2+(4-2)^2}$ | ✓substitute into distance |
| | $= 2\sqrt{17} = 8{,}25$ | ✓answer (A) (8) |
| | | **[8]** |

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**QUESTION 10/*VRAAG* 10**




| | | |
|---|---|---|
| 10.1.1(a) | $y = 1 - 0,893 = 0,107$ (0,11) | ✓ $y = 1 - 0,893$ (1) |
| 10.1.1(b) | $x = 0,893 - 0,733$<br>$= 0,16$ | ✓ $x = 0,893 - 0,733$ (1) |
| 10.1.2 | P(at least 2 events) = 0,1 + 0,15 + 0,16 + 0,2<br>= 0,61 Answer only: Full Marks | ✓ values<br>✓ answer (2) |
| 10.1.3 | P(B) = 0,643<br>P(C) = 0,56<br>P(B and C) = 0,36<br>P(B) × P(C) = 0,643 × 0,56 = 0,36<br>∴ P(B and C) = P(B) × P(C)<br>∴ B and C are independent | ✓ P(B) = 0,643<br>✓ P(C) = 0,56<br>✓ P(B and C) = 0,36<br>✓ P(B) × P(C) = 0,36<br>✓ independent because P(B and C) = P(B) × P(C) (5) |
| 10.2.1 | $7 \times 6 \times 5 \times 4 = 840$ | ✓ 4✓ 7<br>✓ $7 \times 6 \times 5 \times 4 = 840$ (3) |
| 10.2.2 | start with 5, 7, 9 or start with 6 or start with 8<br>$(3 \times 5 \times 1 \times 3) + (1 \times 5 \times 1 \times 2) + (1 \times 5 \times 1 \times 2)$<br>$= 45 + 10 + 10$<br>$= 65$<br>$P = \frac{65}{840} = \frac{13}{168} = 0,08$<br><br>**OR/*OF***<br>ends in 4 or ends in 6 or ends in 8<br>$(5 \times 5 \times 1 \times 1) + (4 \times 5 \times 1 \times 1) + (4 \times 5 \times 1 \times 1)$<br>$= 25 + 20 + 20$<br>$= 65$<br>$P = \frac{65}{840} = \frac{13}{168} = 0,08$ | ✓ $(3 \times 5 \times 1 \times 3) = 45$<br>✓ $(1 \times 5 \times 1 \times 2) = 10$<br>✓ $(1 \times 5 \times 1 \times 2) = 10$<br>✓65<br>✓ answer (5)<br><br>**OR/*OF***<br>✓ $(5 \times 5 \times 1 \times 1) = 25$<br>✓ $(4 \times 5 \times 1 \times 1) = 20$<br>✓ $(4 \times 5 \times 1 \times 1) = 20$<br>✓65<br>✓ answer (5) |
| | | **[17]** |

**TOTAL/*TOTAAL*: 150**

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