



# basic education

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

## **NASIONALE SENIOR SERTIFIKAAT**

**GRAAD 12**

**WISKUNDE V1**

**NOVEMBER 2011**

**MEMORANDUM**

**PUNTE: 150**

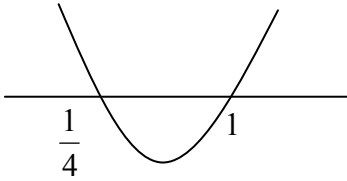
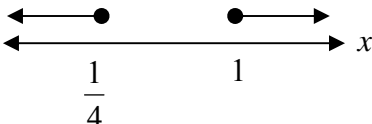
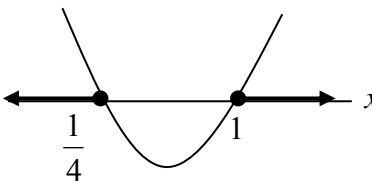
**Hierdie memorandum bestaan uit 27 bladsye.**

**LET WEL:**

- As 'n kandidaat'n vraag TWEE keer beantwoord, merk net die EERSTE poging.
- As 'n kandidaat 'n antwoord deurhaal en nie oordoen nie, merk die deurgehaalde antwoord.
- Deurlopende Akkuraatheid moet deurgaans in die memorandum toegepas word.

**VRAAG 1**

1.1.1	$x(x+1) = 6$ $x^2 + x = 6$ $x^2 + x - 6 = 0$ $(x+3)(x-2) = 0$ $x = -3 \text{ of } 2$ <p><b>OF</b></p> $x^2 + x - 6 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-1 \pm \sqrt{1^2 - 4(1)(-6)}}{2(1)}$ $x = -3 \text{ or } 2$	<p><b>Let wel:</b> Antwoord deur inspeksie: 3/3 punte</p> <p><b>Let wel:</b> Antwoord van slegs <math>x = 2</math>: 1/3 punte</p> <p><b>Let wel:</b> Indien die kandidaat die vergelyking na lineêr verander: 0/3 punte</p>	<p>✓ standaardvorm ✓ faktore ✓ antwoorde (3)</p> <p>✓ standaardvorm ✓ substitusie in die korrekte formule ✓ antwoorde (3)</p>
1.1.2	$3x^2 - 4x = 8$ $3x^2 - 4x - 8 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-8)}}{2(3)}$ $= \frac{4 \pm \sqrt{16 + 96}}{6}$ $= \frac{4 \pm \sqrt{112}}{6}$ $= \frac{2 \pm 2\sqrt{7}}{3}$ $= 2,43 \text{ of } -1,10$ <p><b>OF</b></p> $3x^2 - 4x = 8$ $3x^2 - 4x - 8 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-8)}}{2(3)}$ $= 2,43 \text{ of } -1,10$	<p><b>Let wel:</b> Indien kandidaat verkeerde formule gebruik: maksimum 1/4 punte (vir standaardvorm)</p> <p><b>Let wel:</b> Indien verkeerde vervanging die antwoord van <math>\frac{4 \pm \sqrt{-80}}{6}</math> gee en aandui dat daar geen oplossing is: maksimum 3/4 punte Indien NIE geen oplossing aandui: Maksimum 2/4 punte</p> <p><b>Let wel:</b> Penaliseer 1 punt vir verkeerde afronding tot ENIGE getal desimale plekke indien die antwoord in desimale vorm gegee is.</p>	<p>✓ standaardvorm</p> <p>✓ vervang in korrekte formule</p> <p>✓ <math>\sqrt{112}</math></p> <p>✓ <math>\frac{4 \pm \sqrt{112}}{6}</math> of korrekte desimale antwoorde (4)</p> <p>✓ standaardvorm ✓ vervang in korrekte formule ✓ antwoord ✓ antwoord (4)</p>

1.1.3	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <math display="block">4x^2 + 1 \geq 5x</math> <math display="block">4x^2 - 5x + 1 \geq 0</math> <math display="block">(4x - 1)(x - 1) \geq 0</math> <table style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="padding: 0 10px;">+</td> <td style="padding: 0 10px;">0</td> <td style="padding: 0 10px;">-</td> <td style="padding: 0 10px;">0</td> <td style="padding: 0 10px;">+</td> </tr> <tr> <td></td> <td style="text-align: center;"><math>\frac{1}{4}</math></td> <td></td> <td style="text-align: center;">1</td> <td></td> </tr> </table> </div> <div style="width: 45%; text-align: center;">  </div> </div> <div style="margin-top: 20px;"> <math display="block">x \leq \frac{1}{4} \text{ of } x \geq 1 \quad \text{OR} \quad (-\infty; \frac{1}{4}] \cup [1; \infty)</math> </div> <div style="margin-top: 10px;"> <p><b>OF</b></p> <div style="text-align: center;">  </div> </div> <div style="margin-top: 10px;"> <p><b>OF</b></p> <div style="text-align: center;">  </div> </div> <div style="border: 1px solid black; padding: 10px; margin-top: 10px; width: fit-content; margin-left: auto;"> <p><b>Let wel:</b> Indien kandidaat hierdie korrekte grafiese oplossings gee, maar die verkeerde intervale neerskryf of <b>EN</b> gebruik: Maksimum 3/4 punte</p> </div>	+	0	-	0	+		$\frac{1}{4}$		1		<p>\</p> <p>✓ faktore</p> <p>✓ beide kritieke waardes van <math>\frac{1}{4}</math> en 1</p> <p>✓ of <b>OF</b> <math>\cup</math></p> <p>✓ antwoord</p>
+	0	-	0	+								
	$\frac{1}{4}$		1									
	(4)											

**LET WEL:**

Indien kandidaat die antwoord gee as  $1 \leq x \leq \frac{1}{4}$  maksimum 3/4 punte.

Indien kandidaat die antwoord gee as  $\frac{1}{4} \leq x \leq 1$  maksimum 2/4 punte.

Indien kandidaat antwoord gee as  $x \leq \frac{1}{4}$  **en**  $x \geq 1$  maksimum 3/4 punte.

Indien kandidaat die antwoord gee sonder die gelyk aan tekens penaliseer met 1 punt.

Indien kandidaat antwoord gee as  $x \leq \frac{1}{4}$  ;  $x \geq 1$  maksimum 3/4 punte.

Indien kandidaat die antwoord gee as  $x \geq \frac{1}{4}$  of/en  $x \geq 1$ :

**WISKUNDIGE REDENERINGSFOUT:** maksimum 2/4 punte.

Indien kandidaat slegs

as antwoord gee:  
maks 3/4 punte

+	0	-	0	+
	$\frac{1}{4}$		1	

1.2.1	$x^2 + 5xy + 6y^2 = 0$ $(x + 3y)(x + 2y) = 0$ $x + 3y = 0 \qquad x + 2y = 0$ $x = -3y \qquad \text{OF} \qquad x = -2y$ $\frac{x}{y} = -3 \qquad \frac{x}{y} = -2$ <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p><b>Let wel:</b> Indien kandidaat die antwoord gee as  <math>-\frac{x}{y} = 3</math> of <math>-\frac{x}{y} = 2</math>  2/3 punte</p> </div> <p><b>OF</b></p> <p>Let <math>k = \frac{x}{y}</math></p> $x^2 + 5xy + 6y^2 = 0$ $\left(\frac{x}{y}\right)^2 + 5\left(\frac{x}{y}\right) + 6 = 0$ $k^2 + 5k + 6 = 0$ $(k + 3)(k + 2) = 0$ $k = -3 \text{ or } k = -2$ $\frac{x}{y} = -3 \text{ or } \frac{x}{y} = -2$ <p><b>OF</b></p> $x^2 + 5xy + 6y^2 = 0$ $x = \frac{-5y \pm \sqrt{(5y)^2 - 4(1)(6y^2)}}{2(1)}$ $x = \frac{-5y \pm \sqrt{y^2}}{2}$ $x = \frac{-5y \pm y}{2}$ $x = -3y \qquad x = -2y$ $\frac{x}{y} = -3 \text{ of } \frac{x}{y} = -2$ <p><b>OF</b></p> $x^2 + 5xy + 6y^2 = 0$ $x^2 + 5xy + \left(\frac{5}{2}y\right)^2 = -6y^2 + \left(\frac{5}{2}y\right)^2$ $\left(x + \frac{5}{2}y\right)^2 = \frac{1}{4}y^2$ $x + \frac{5}{2}y = \pm \frac{1}{2}y$ $x = -\frac{5}{2}y \pm \frac{1}{2}y$	<p>✓ faktore</p> <p>✓✓ antwoorde (3)</p> <p>✓ faktore</p> <p>✓✓ antwoorde (3)</p> <p>✓ formule</p> <p>✓✓ antwoorde (3)</p> <p>✓ vierkantsvoltooiing</p>
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	$x = -3y \quad x = -2y$ $\frac{x}{y} = -3 \quad \text{of} \quad \frac{x}{y} = -2$ <p><b>OF</b></p> <p>Let <math>k = \frac{x}{y}</math>  <math>x = ky</math></p> $x^2 + 5xy + 6y^2 = 0$ $(ky)^2 + 5y(ky) + 6y^2 = 0$ $k^2 y^2 + 5y^2 k + 6y^2 = 0$ $y^2(k^2 + 5k + 6) = 0$ $(k^2 + 5k + 6) = 0$ $(k + 3)(k + 2) = 0$ $k = -3 \quad \text{or} \quad k = -2$ $\frac{x}{y} = -3 \quad \text{or} \quad \frac{x}{y} = -2$ <p><b>Let wel:</b> <math>(x;y) = (0;0)</math> is ook 'n oplossing, maar in die geval is <math>\frac{x}{y}</math> ongedefinieerd.</p> <p><b>OF</b></p> <p>Laat <math>y = 1</math>,</p> $x^2 + 5x + 6 = 0$ $(x + 2)(x + 3) = 0$ $x = -2 \quad \text{or} \quad x = -3$ $\frac{x}{y} = -2 \quad \text{or} \quad \frac{x}{y} = -3$	<p>✓✓ antwoorde (3)</p> <p>✓ faktore</p> <p>✓✓ antwoorde (3)</p> <p>✓ faktore</p> <p>✓✓ antwoorde (3)</p>
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1.2.2	$\begin{array}{ll} x + y = 8 & x + y = 8 \\ -3y + y = 8 & -2y + y = 8 \\ -2y = 8 & \text{OF} \quad -y = 8 \\ y = -4 & y = -8 \\ x = 12 & x = 16 \end{array}$ <p><b>OF</b></p> $\begin{array}{ll} \frac{8-y}{y} = -3 & \text{OF} \quad \frac{8-y}{y} = -2 \\ 8-y = -3y & 8-y = -2y \\ 8 = -2y & 8 = -y \\ y = -4 & y = -8 \\ x = 12 & x = 16 \end{array}$ <p><b>OF</b></p> $\begin{array}{ll} x + y = 8 & \\ y = 8 - x & \\ \frac{x}{8-x} = -3 & \text{OF} \quad \frac{x}{8-x} = -2 \\ x = -3(8-x) & x = -2(8-x) \\ x = -24 + 3x & x = -16 + 2x \\ -2x = -24 & -x = -16 \\ x = 12 & x = 16 \\ y = -4 & y = -8 \end{array}$ <p><b>OF</b></p> $\begin{array}{l} (x+2y)(x+3y) = 0 \\ x + y = 8 \\ x = 8 - y \\ (y+8)(2y+8) = 0 \\ y = -8 \text{ of } y = -4 \\ x = 16 \quad x = 12 \end{array}$ <p><b>OF</b></p> $\begin{array}{l} x = 8 - y \\ (8-y)^2 + 5(8-y)y + 6y^2 = 0 \\ 64 - 16y + y^2 + 40y - 5y^2 + 6y^2 = 0 \\ 2y^2 + 24y + 64 = 0 \\ y^2 + 12y + 32 = 0 \\ (y+8)(y+4) = 0 \\ y = -8 \text{ OF } y = -4 \\ x = 16 \quad x = 12 \end{array}$	<p>✓ substitusie  <math>x = -3y</math>  ✓ subs <math>x = -2y</math>  ✓✓ y-waardes  ✓ beide x-waardes  korrek  (5)</p> <p>✓ <math>x = 8 - y</math>  ✓ substitusie    ✓✓ y-waardes  ✓ beide x-waardes  korrek  (5)</p> <p>✓ <math>y = 8 - x</math>  ✓ subs    ✓✓ x-waardes  ✓ beide y-waardes  korrek  (5)</p> <p>✓ <math>x = 8 - y</math>  ✓ subs  ✓✓ y-waardes  ✓ beide x-waardes  korrek  (5)</p> <p>✓ <math>x = 8 - y</math>  ✓ subs  ✓ faktore  ✓ beide y-waardes  korrek  ✓ beide x-waardes  korrek  (5)</p>
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	<p><b>OF</b></p> $x = 8 - y$ $(8 - y)^2 + 5(8 - y)y + 6y^2 = 0$ $64 - 16y + y^2 + 40y - 5y^2 + 6y^2 = 0$ $2y^2 + 24y + 64 = 0$ $y^2 + 12y + 32 = 0$ $y = \frac{-12 \pm \sqrt{12^2 - 4(1)(32)}}{2(1)}$ $= \frac{-12 \pm \sqrt{16}}{2}$ $y = -8 \quad \text{OR} \quad y = -4$ $x = 16 \quad \quad x = 12$ <p><b>OF</b></p> $y = 8 - x$ $x^2 + 5x(8 - x) + 6(8 - x)^2 = 0$ $x^2 + 40x - 5x^2 + 6(64 - 16x + x^2) = 0$ $2x^2 - 56x + 384 = 0$ $x^2 - 28x + 192 = 0$ $(x - 16)(x - 12) = 0$ $x = 12 \quad \text{OR} \quad x = 16$ $y = -4 \quad \text{OF} \quad y = -8$ <p><b>OF</b></p> $y = 8 - x$ $x^2 + 5x(8 - x) + 6(8 - x)^2 = 0$ $x^2 + 40x - 5x^2 + 6(64 - 16x + x^2) = 0$ $2x^2 - 56x + 384 = 0$ $x^2 - 28x + 192 = 0$ $x = \frac{-(-28) \pm \sqrt{(-28)^2 - 4(1)(192)}}{2(1)}$ $= \frac{28 \pm \sqrt{416}}{2}$ $x = 12 \quad \text{OR} \quad x = 16$ $y = -4 \quad \quad y = -8$	<p>✓ <math>y = 8 - x</math></p> <p>✓ subs</p> <p>✓ substitusie in korrekte formule</p> <p>✓ beide <math>y</math>-waardes korrek</p> <p>✓ beide <math>x</math>-waardes korrek (5)</p> <p>✓ <math>y = 8 - x</math></p> <p>✓ subs</p> <p>✓ faktore</p> <p>✓ beide <math>x</math>-waardes korrek</p> <p>✓ beide <math>y</math>-waardes korrek (5)</p> <p>✓ <math>y = 8 - x</math></p> <p>✓ subs</p> <p>✓ substitusie in korrekte formule</p> <p>✓ beide <math>x</math>-waardes korrek</p> <p>✓ beide <math>y</math>-waardes korrek (5)</p> <p><b>[19]</b></p>
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**VRAAG 2**

2.1.1	$x - 4 = 32 - x$ $2x = 36$ $x = 18$  <b>OF</b> $a = 4$ $a + 2d = 32$ $2d = 28$ $d = 14$ $x = 14 + 4$ $x = 18$  <b>OF</b> $x = \frac{4+32}{2} = 18$	<div style="border: 1px solid black; padding: 5px; margin: 5px;"> <b>Let wel:</b>  Slegs antwoord:  2/2 punte </div> <div style="border: 1px solid black; padding: 5px; margin: 5px;"> <b>Let wel:</b>  Indien kandidaat slegs  <math>x - 4 = 32 - x</math> skryf  (i.e. geen gelyk aan  teken) :  0/2 punte </div>	$\checkmark T_2 - T_1 = T_3 - T_2$  $\checkmark$ antwoord (2)  $\checkmark a + 2d = 32$ en $a = 4$  $\checkmark$ antwoord (2)  $\checkmark$ vervang korrek in rekenkundige gemiddeld formule i.e. $\frac{4+32}{2}$ $\checkmark$ antwoord (2)
2.1.2	$\frac{x}{4} = \frac{32}{x}$ $x^2 = 128$ $x = \pm\sqrt{128}$ $x = \pm 8\sqrt{2}$ of $x = \pm 11,31$ of $x = \pm 2^{\frac{7}{2}}$  <b>OF</b> $a = 4$ $r = \frac{x}{4}$ $ar^2 = 4\left(\frac{x}{4}\right)^2$ $32 = 4\left(\frac{x}{4}\right)^2$ $x^2 = 128$ $x = \pm\sqrt{128}$ $x = \pm 8\sqrt{2}$ of $x = \pm 11,31$ of $x = \pm 2^{\frac{7}{2}}$  <b>OR</b> $x = \pm\sqrt{4 \times 32}$ $= \pm\sqrt{128}$ $x = \pm 8\sqrt{2}$ of $x = \pm 11,31$ of $x = \pm 2^{\frac{7}{2}}$	<div style="border: 1px solid black; padding: 5px; margin: 5px;"> <b>Let wel:</b> Indien  kandidaat slegs  <math>\frac{x}{4} = \frac{32}{x}</math> skryf (i.e. geen  gelyk aan teken) :  0/2 marks </div> <div style="border: 1px solid black; padding: 5px; margin: 5px;"> <b>Let wel:</b>  As slegs <math>x = \sqrt{128}</math>,  penaliseer met 1 punt </div>	$\checkmark \frac{T_2}{T_1} = \frac{T_3}{T_2}$ $\checkmark x^2 = 128$  $\checkmark$ beide antwoorde (wortel-of desimale vorm) (3)  $\checkmark 32 = 4\left(\frac{x}{4}\right)^2$ $\checkmark x^2 = 128$  $\checkmark$ beide antwoorde (3)  $\checkmark \checkmark$ vervang korrek in meetkundige gemiddeld formule i.e. $\pm\sqrt{4 \times 32}$ $\checkmark$ beide antwoorde (3)



2.2	$P = \sum_{k=1}^{13} 3^{k-5}$ $= 3^{1-5} + 3^{2-5} + 3^{3-5} + \dots + 3^{13-5}$ $= 3^{-4} + 3^{-3} + 3^{-2} + \dots + 3^8$ $= \frac{3^{-4}(3^{13} - 1)}{3 - 1}$ $= 9841,49 \quad \text{OF} \quad 9841\frac{40}{81} \quad \text{OF} \quad \frac{797161}{81}$ <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <b>Let wel:</b> Slegs korrekte antwoord: 1/4 punte.         </div> <p><b>OF</b></p> $P = \sum_{k=1}^{13} 3^{k-5}$ $= 3^{1-5} + 3^{2-5} + 3^{3-5} + \dots + 3^{13-5}$ $= 3^{-4} + 3^{-3} + 3^{-2} + \dots + 3^8$ $= \frac{1}{81} + \frac{1}{27} + \frac{1}{9} + \dots + 6561$ $= 9841,49 \quad \text{OR} \quad 9841\frac{40}{81} \quad \text{OR} \quad \frac{797161}{81}$ <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <b>Let wel:</b> Indien kandidaat afrond en die antwoord as 9841,46(i.e. korrek tot een desimale plek) gee: GEEN penalisering vir afronding.         </div>	<p>✓ <math>a = 3^{-4}</math></p> <p>✓ <math>r = 3</math></p> <p>✓ vervang in korrekte formule</p> <p>✓ antwoord (4)</p> <p>✓✓ korrekte uitbreiding</p> <p>✓ 13 terme in die reeks</p> <p>✓ antwoord (4)</p>
2.3	$S_n = a + [a + d] + [a + 2d] + \dots + [a + (n-2)d] + [a + (n-1)d]$ $S_n = [a + (n-1)d] + [a + (n-2)d] + \dots + [a + d] + a$ $2S_n = [2a + (n-1)d] + [2a + (n-1)d] + \dots + [2a + (n-1)d] + [2a + (n-1)d]$ $= n[2a + (n-1)d]$ $S_n = \frac{n}{2}[2a + (n-1)d]$ <p><b>OF</b></p> $S_n = a + [a + d] + [a + 2d] + \dots + (T_n - d) + T_n$ $S_n = T_n + (T_n - d) + \dots + [a + d] + a$ $2S_n = a + T_n + a + T_n + a + T_n + \dots + a + T_n$ $= n[a + a + (n-1)d]$ $= [2a + (n-1)d]$ $S_n = \frac{n}{2}[2a + (n-1)d]$ <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <b>Let wel:</b> Indien kandidaat 'n wederkerende argument gebruik(bv <math>S_{n+1} = S_n + T_n</math> : Maksimum 1/4 punte (vir uitskryf van <math>S_n</math>)         </div> <p><b>Note:</b> If a candidate uses a specific linear sequence, then NO marks.</p>	<p>✓ skryf <math>S_n</math> uit</p> <p>✓ 'omgedraaide' <math>S_n</math></p> <p>✓ uitskryf van <math>2S_n</math></p> <p>✓ groepeer om te kry <math>2S_n = n[2a + (n-1)d]</math> (4)</p> <p>✓ skryf uit <math>S_n</math></p> <p>✓ 'omgedraaide' <math>S_n</math></p> <p>✓ uitskryf van <math>2S_n</math></p> <p>✓ groepeer om te kry <math>2S_n = n[a + a + (n-1)d]</math> (4)</p> <p style="text-align: right;"><b>[13]</b></p>

**VRAAG 3**

3.1	21; 24	<b>Let wel:</b> Indien kandidaat $T_8 = 21$ $T_7 = 24$ as antwoord gee: Maksimum 1/2 punte	✓ 21 ✓ 24 (2)
3.2	$T_{2k} = 3.2^{k-1}$ en dus $T_{52} = 3.2^{26-1} = 100663296$  $T_{2k-1} = 6k - 3$ en dus $T_{51} = 6(26) - 3 = 153$  $T_{52} - T_{51} = 100663296 - 153$ $= 100663143$  <b>OF</b>  Oorweeg ry $P$ : 3 ; 6 ; 12 ... $P_n = 3.2^{n-1}$ $P_{26} = 3.2^{26-1} = 100663296$  Oorweeg ry $Q$ : 3; 9; 15 ... $Q_n = 6n - 3$ $Q_{26} = 6(26) - 3 = 153$ $T_{52} - T_{51} = P_{26} - Q_{26}$ $= 100663296 - 153$ $= 100663143$	<b>Let wel:</b> Indien kandidaat die 52 terme uitskryf en die korrekte antwoord kry: 5/5  <b>Let wel:</b> Indien kandidaat $k = 52$ gebruik: Maksimum 2/5  <b>Let wel:</b> Indien kandidaat die 52 terme uitskryf en $T_{51} - T_{52}$ doen: Maksimum 4/5 punte  <b>Let wel:</b> Indien kandidaat die orde omruil i.e. doen $T_{51} - T_{52}$ : Maksimum 4/5 marks	✓ $T_{2k} = 3.2^{k-1}$ ✓ $T_{52}$  ✓ $T_{2k-1} = 6k - 3$ ✓ $T_{51}$  ✓ antwoord (5)  ✓ $P_n = 3.2^{n-1}$ ✓ $P_{26}$  ✓ $Q_n = 6n - 3$ ✓ $Q_{26}$  ✓ antwoord (5)
3.3	Vir alle $n \in \mathbf{N}$ , $n = 2k$ of $n = 2k - 1$ vir $k \in \mathbf{N}$  As $n = 2k$ : $T_n = T_{2k} = 3.2^{k-1}$  As $n = 2k - 1$ : $T_n = T_{2k-1}$ $= 6k - 3$ $= 3(2k - 1)$  In beide gevalle is 3 'n faktor van $T_n$ , en dus deelbaar deur 3.  <b>OF</b>  $P_n = 3.2^{n-1}$ 'n Veelvoud van 3  $Q_n = 6n - 3$ $= 3(2n - 1)$ Ook 'n veelvoud van 3	<b>Let wel:</b> Indien kandidaat deling deur 3 slegs vir 'n gekose gedeelte van die ry bewys en nie deur van die algemene term gebruik te maak nie: 0/2 punte	✓ faktore $3.2^{k-1}$  ✓ faktore $3(2k - 1)$ (2)  ✓ faktore $3.2^{k-1}$  ✓ faktore $3(2k - 1)$

	<p>Omdat <math>T_n = Q_{2k-1}</math> of <math>T_n = P_{2k}</math> vir alle <math>n \in \mathbf{N}</math>, sal <math>T_n</math> altyd deelbaar wees deur 3</p> <p><b>OF</b> Die onewe terme is onewe veelvoude van 3 en die ewe terme is 3 maal 'n mag van 2. Dit beteken al die terme is veelvoude van 3 en dus deelbaar deur 3.</p>	<p>(2)</p> <p>✓ onewe veelvoude van 3 ✓ 3 maal 'n mag van 2</p> <p>(2) <b>[9]</b></p>
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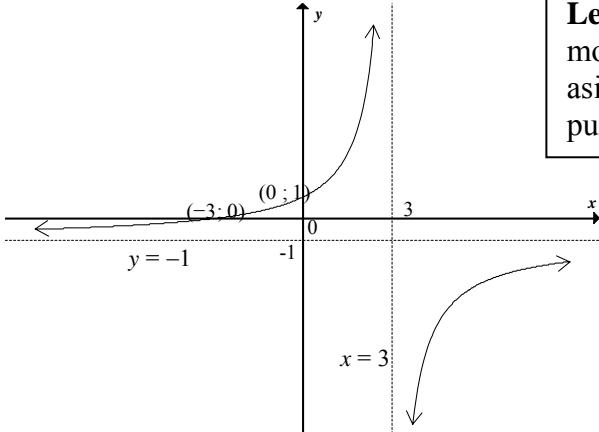
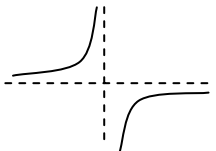
**VRAAG 4**

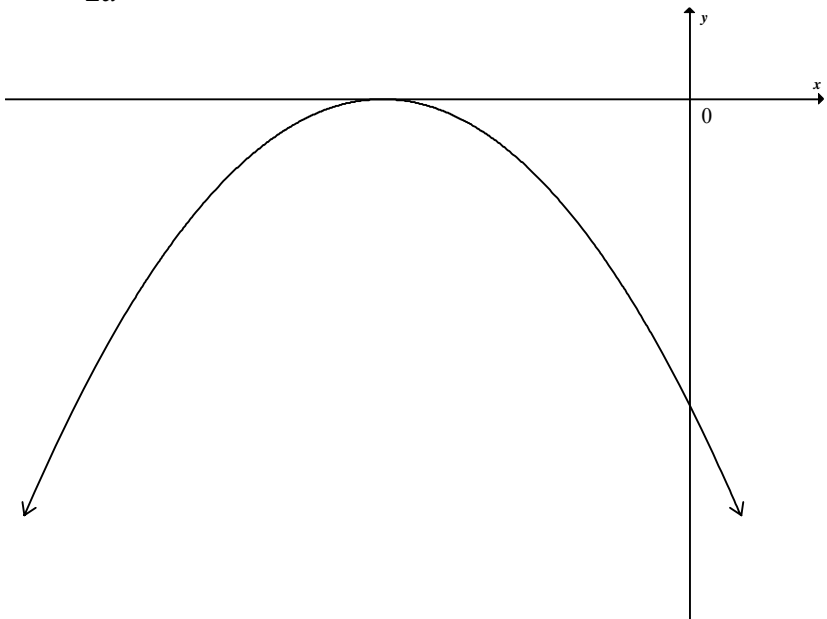
4.1	<p>Die tweede, derde, vierde en vyfde termyn is 1 ; - 6 ; <math>T_4</math> en - 14</p> <p>Eerste Verkille is: <math>-7, +6; T_4; -14 - T_4</math>  <math>T_4 + 6 + 7 = -14 - 2 T_4 - 6</math>  <math>T_4 = -11</math>  <math>d = -11 + 6 + 7 = 2</math> or <math>-14 + 22 - 6 = 2</math></p> <div style="border: 1px solid black; padding: 5px; display: inline-block; width: 200px;"> <p><b>Let wel:</b> Slegs antwoord(i.e <math>d = 2</math>) met geen bewys van uitwerking: 3 /5</p> </div> <div style="border: 1px solid black; padding: 5px; display: inline-block; width: 200px; margin-top: 10px;"> <p><b>Let wel:</b> Kandidaat gebruik probeer en verbeter metode <b>en</b> wys die metode: 5/5 punte</p> </div> <div style="border: 1px solid black; padding: 5px; display: inline-block; width: 200px; margin-top: 10px;"> <p><b>Let wel:</b> Kandidaat gee slegs <math>T_4 = -11</math> en <math>d = 2</math>: 5/5 punte</p> </div> <p><b>OF</b></p> <div style="text-align: center; margin: 20px 0;"> <math display="block">  \begin{array}{ccccccc}  T_2 &amp; &amp; T_3 &amp; &amp; T_4 &amp; &amp; T_5 \\  1 &amp; &amp; -6 &amp; &amp; &amp; &amp; -14 \\  &amp; \swarrow &amp; \nearrow &amp; \swarrow &amp; \nearrow &amp; \swarrow &amp; \nearrow \\  &amp; -7 &amp; &amp; -7+d &amp; &amp; -7+2d &amp; \\  &amp; \searrow &amp; \swarrow &amp; \searrow &amp; \swarrow &amp; \searrow &amp; \\  &amp; &amp; d &amp; &amp; d &amp; &amp;   \end{array}  </math> </div> <p> <math>T_5 - T_2 = (T_5 - T_4) + (T_4 - T_3) + (T_3 - T_2)</math>  <math>-15 = (-7 + 2d) + (-7 + d) + -7</math>  <math>-15 = -21 + 3d</math>  <math>6 = 3d</math>  <math>d = 2</math> </p> <p><b>OF</b></p> <p> <math>4a + 2b + c = 1</math>  <math>9a + 3b + c = -6</math>  <math>5a + b = -7</math> </p> <p> <math>25a + 5b + c = -14</math>  <math>16a + 2b = -8</math>  <math>10a + 2b = -14</math>  <math>6a = 6</math>  <math>a = 1</math>  <math>d = 2a = 2</math> </p>	<p>✓ - 7          ✓ <math>T_4 + 6</math>          ✓ <math>-14 - T_4</math>          ✓ uiteensetting van  <math>T_5 - T_2 = (T_5 - T_4) + (T_4 - T_3) + (T_3 - T_2)</math>          ✓ antwoord</p> <p>(5)</p> <p>✓ - 7          ✓ <math>-7 + d</math>          ✓ <math>-7 + 2d</math></p> <p>✓ uiteensetting van  <math>T_5 - T_2 = (T_5 - T_4) + (T_4 - T_3) + (T_3 - T_2)</math>          ✓ antwoord</p> <p>(5)</p> <p>✓ <math>4a + 2b + c = 1</math>          ✓ <math>9a + 3b + c = -6</math></p> <p>✓ <math>25a + 5b + c = -14</math>          ✓ gelyktydige          vergelyking</p> <p>✓ antwoord</p>
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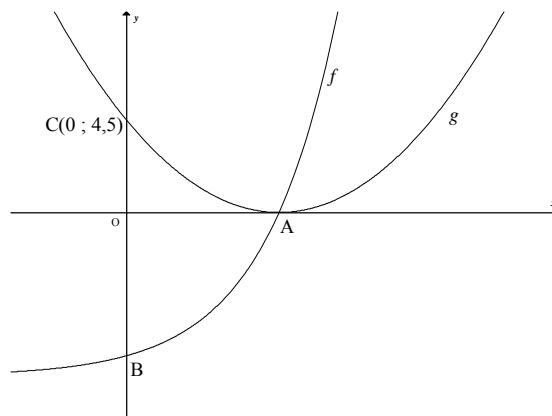
	<p><b>OF</b></p> $  \begin{array}{ccccccc}  T_1 & & 1 & & -6 & & T_4 \\  & \searrow & & \swarrow & & \searrow & \\  & 1 - T_1 & & -7 & & T_4 + 6 & \\  & & T_1 - 8 & & T_4 + 13 & & -20 - 2T_4 \\  & & & & & & -14 - T_4 \\  & & & & & & -14  \end{array}  $ <p> <math>T_4 + 13 = -20 - 2T_4</math>  <math>3T_4 = -33</math>  <math>T_4 = -11</math>  <math>d = -11 + 13</math>  <math>d = 2</math> </p> <p><b>OF</b></p> $  \begin{array}{ccccccc}  T_1 & & T_2 & & T_3 & & T_4 \\  x & & 1 & & -6 & & y \\  & \searrow & & \swarrow & & \searrow & \\  & 1 - x & & -7 & & y + 6 & \\  & & -8 + x & & y + 13 & & -20 - 2y \\  & & & & & & -14 - y \\  & & & & & & -14  \end{array}  $ <p> <math>y + 13 = -20 - 2y</math>  <math>3y = -33</math>  <math>y = -11</math> </p> <p>Tweede verskil = <math>y + 13 = -11 + 13 = 2</math></p>	<p>(5)</p> <p>✓ <math>-7</math> ✓ <math>T_4 + 6</math> ✓ <math>-14 - T_4</math></p> <p>✓ uiteensetting van vergelyking ✓ antwoord</p> <p>(5)</p> <p>✓ <math>-7</math> ✓ <math>y + 6</math> ✓ <math>-14 - y</math></p> <p>✓ uiteensetting van vergelyking ✓ antwoord</p> <p>(5)</p>
4.2	$  \begin{array}{ccc}  T_1 & & 1 \\  & \searrow & \swarrow \\  & -9 & -7 \\  & & 2  \end{array}  $ <p><b>Let wel:</b> Slegs antwoord: 2/2 punte</p> <p><math>T_1 = 10</math></p> <p><b>OF</b></p> <p> <math>a = 1</math>  <math>5a + b = -7</math>  <math>5(1) + b = -7</math>  <math>b = -12</math>  <math>a + b + c = 1</math>  <math>4(1) + 2(-12) + c = 1</math>  <math>c = 21</math>  <math>T_n = n^2 - 12n + 21</math>  <math>T_1 = (1)^2 - 12(1) + 21</math>  <math>= 10</math> </p> <p><b>OF</b></p> <p><b>Let wel:</b> Verkeerde d-waarde in 4.1: 2/2 DA punte  <math>T_1 = d + 8</math>          (siende dat <math>1 - T_1 = -7 - d</math>)</p>	<p>✓ metode</p> <p>✓ <math>T_1 = 10</math></p> <p>(2)</p> <p>✓ metode</p> <p>✓ <math>T_1 = 10</math></p> <p>(2)</p>

	$T_4 + 13 = -8 + T_1$ $-11 + 13 = -8 + T_1$ $T_1 = 10$	$y + 13 = -8 + x$ $-11 + 13 = -8 + x$ $x = 10$	✓ metode ✓ $T_1 = 10$ (2) <b>[7]</b>
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**VRAAG 5**

5.1.1	$y = f(0)$ $= \frac{-6}{0-3} - 1$ $= 1$ $(0 ; 1)$ <b>OF</b> $x = 0$ en $y = 1$	<b>Let wel:</b> Merk 5.1.1 en 5.1.2 as 'n eenheid. Indien die afsnitte omgeruil is: Maksimum 3/5 punte	✓ $y = 1$ ✓ $x = 0$ (2)
5.1.2	$0 = \frac{-6}{x-3} - 1$ $1 = \frac{-6}{x-3}$ $x - 3 = -6$ $x = -3$ $(-3 ; 0)$		✓ $y = 0$ ✓ $x - 3 = -6$ ✓ antwoord (3)
5.1.3		<b>Let wel:</b> Die grafiek moet neig na die asimptoot ten einde die punt vir die vorm te kry  <b>Let wel:</b> As kandidaat slegs een 'arm' geteken het, word die 'vorm' punt verbeur. Maksimum 2/3	✓ vorm  ✓ beide afsnitte ✓ horisontale asimptoot ✓ vertikale asimptoot (4)
5.1.4	$-3 < x < 3$ <b>OF</b> $(-3 ; 3)$ <b>OF</b> $x > -3$ and $x < 3$ <b>Let wel:</b> As kandidaat slegs $x > -3$ gee: 1/2 punte	<b>Let wel:</b> As kandidaat slegs $x < 3$ gee: 1/2 punte	✓ $-3$ en $3$ ✓ ongelykheid of interval notasie (2)
5.1.5	$y = \frac{-6}{-2-3} - 1$ $= \frac{1}{5}$ $m = \frac{1 - \frac{1}{5}}{0 - (-2)}$ $= \frac{2}{5}$ <b>OF</b>		✓ $\frac{1}{5}$ ✓ formule ✓ substitusie ✓ antwoord (4)

	$m = \frac{f(0) - f(-2)}{0 - (-2)}$ $= \frac{1 - \frac{1}{5}}{0 + 2}$ $= \frac{2}{5}$	✓ formule ✓ $f(-2) = \frac{1}{5}$ ✓ substitusie ✓ antwoord (4)
5.2	$x = -\frac{b}{2a} < 0$ want $b < 0$ en $a < 0$ 	✓ y-afsnit negatief ✓ draaipunt op x-as ✓ draaipunt links van die y-as ✓ <b>maksimum</b> draaipunt en kwadratiese vorm (4) <b>[19]</b>

**VRAAG 6**

6.1	$0 = 2^x - 8$ $8 = 2^x$ $2^3 = 2^x$ $x = 3$ $A(3; 0)$	$f(0) = 2^0 - 8$ $= 1 - 8$ $= -7$ $B(0; -7)$	✓ $y = 0$ ✓ antwoord vir A ✓ $x = 0$ ✓ antwoord vir B (4)
6.2	$y = -8$ <b>OF</b> $y + 8 = 0$	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <b>Let wel:</b> geen DA punte         </div>	✓ antwoord (1)
6.3	$h(x) = f(2x) + 8$ $= (2^{2x} - 8) + 8$ $= 4^x$ of $2^{2x}$	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <b>Let wel:</b> slegs antwoord :            2/2 punte         </div>	✓ $(2^{2x} - 8)$ ✓ antwoord van $h(x) = 4^x$ of $2^{2x}$ (2)
6.4	$x = 4^y$ <b>OF</b> $x = 2^{2y}$ $y = \log_4 x$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-top: 10px;"> <b>Let wel:</b> slegs antwoord:            2/2 punte         </div>	$2y = \log_2 x$ $y = \frac{1}{2} \log_2 x$ or $y = \log_2 \sqrt{x}$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-top: 10px;"> <b>Let wel:</b> kandidaat            werk <math>f^{-1}</math> uit en kry  <math>y = \log_2(x + 8)</math>:            1/2 punte         </div>	✓ ruil van $x$ en $y$ ✓ antwoord in die vorm $y = \dots$ (2)
6.5	$p(x) = -\log_4 x$ <b>OF</b> $p(x) = \log_{\frac{1}{4}} x$ <b>OF</b> $p(x) = \log_4 \frac{1}{x}$ <b>OF</b> $p(x) = -\frac{1}{2} \log_2 x$ <b>OF</b> $y = -\log_2 \sqrt{x}$		✓ antwoord (1)

6.6

$$\sum_{k=0}^3 g(k) - \sum_{k=4}^5 g(k)$$

$$= g(0) + g(1) + g(2) + g(3) - g(4) - g(5)$$

$x = 3$  is die simmetrie- as van  $g$ :

Deur simmetrie

$$g(2) = g(4) \text{ en } g(1) = g(5)$$

$$\begin{aligned} \text{Antwoord} &= g(0) + g(3) \\ &= 4,5 + 0 \\ &= 4,5 \end{aligned}$$

**OF**

$$\sum_{k=0}^3 g(k) - \sum_{k=4}^5 g(k)$$

$$\sum_{k=0}^3 g(k) = g(0) + g(1) + g(2) + g(3)$$

$$\sum_{k=4}^5 g(k) = g(4) + g(5)$$

$x = 3$  is die simmetrie - as van  $g$ :

Deur simmetrie

$$g(4) = g(2)$$

$$g(5) = g(1)$$

$$\sum_{k=0}^3 g(k) - \sum_{k=4}^5 g(k)$$

$$= g(0) + g(3)$$

$$= 4,5 + 0$$

$$= 4,5$$

**OF**

$$g(x) = a(x-3)^2 + 0$$

$$4,5 = a(0-3)^2 + 0$$

$$4,5 = 9a$$

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

$$g(x) = \frac{1}{2}(x-3)^2$$

$$\sum_{k=0}^3 g(k) - \sum_{k=4}^5 g(k)$$

$$\sum_{k=0}^3 g(k) = g(0) + g(1) + g(2) + g(3)$$

$$= 4,5 + 2 + 0,5 + 0$$

$$= 7$$

$$\checkmark = g(0) + g(1) + g(2) + g(3) - g(4) - g(5)$$

$$\checkmark g(2) = g(4) \text{ en } g(1) = g(5)$$

$$\checkmark g(0) + g(3)$$

$$\checkmark \text{ antwoord}$$

(4)

$$\checkmark \text{ uitbreiding}$$

$$\checkmark g(2) = g(4) \text{ en } g(1) = g(5)$$

$$\checkmark g(0) + g(3)$$

$$\checkmark \text{ antwoord}$$

(4)

$$\checkmark g(x) = \frac{1}{2}(x-3)^2$$

$$\checkmark \text{ uitbreiding}$$





**VRAAG 7**

7.1	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <math display="block">A = P(1 - i)^n</math> <math display="block">\frac{P}{2} = P(1 - 0,07)^n</math> <math display="block">\frac{1}{2} = 0,93^n</math> <math display="block">\log \frac{1}{2} = n \log 0,93</math> <math display="block">n = \frac{\log \frac{1}{2}}{\log 0,93}</math> <math display="block">= 9,55 \text{ jaar}</math> </div> <div style="width: 10%; text-align: center;"><b>OF</b></div> <div style="width: 45%;"> <math display="block">A = P(1 - i)^n</math> <math display="block">\frac{P}{2} = P(1 - 0,07)^n</math> <math display="block">\frac{1}{2} = 0,93^n</math> <math display="block">\log_{0,93} \frac{1}{2} = n</math> <math display="block">n = 9,55 \text{ years}</math> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%; border: 1px solid black; padding: 5px;"> <p><b>Let wel:</b> Indien kandidaat <math>A</math> en <math>P</math> omruil en dus <math>P = \frac{A}{2}</math> gebruik: maksimum 2/4</p> </div> <div style="width: 45%; border: 1px solid black; padding: 5px;"> <p><b>Let wel:</b> Indien kandidaat verkeerde formule gebruik: Maksimum 1/4 punte vir <math>A = \frac{P}{2}</math></p> </div> </div>	<div style="display: flex; flex-direction: column; align-items: flex-end;"> <div>✓ <math>A = \frac{P}{2}</math></div> <div>✓ subs in korrekte formule</div> <div>✓ log</div> <div>✓ antwoord</div> <div>(4)</div> </div>
7.2	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>Radesh:</b></p> <math display="block">A = P(1 + in)</math> <math display="block">= 6\,000(1 + 0,085 \times 5)</math> <math display="block">= 8\,550</math> <p>Bonus = <math>0,05 \times 6\,000</math></p> <math display="block">= 300</math> <p>Ontvang = <math>8\,550 + 300</math></p> <math display="block">= R8\,850</math> <p><b>Thandi:</b></p> <math display="block">A = P(1 + i)^n</math> <math display="block">= 6\,000 \left(1 + \frac{0,08}{4}\right)^{20}</math> <math display="block">= R8\,915,68</math> <p>Thandi se belegging is groter.</p> </div> <div style="width: 45%;"> <math display="block">A = 6\,000 + 8,5\% \text{ van } 6\,000 \times 5</math> <math display="block">= 6\,000 + 510 \times 5</math> <math display="block">= 6\,000 + 2\,550</math> <math display="block">= 8\,550</math> </div> </div>	<div style="display: flex; flex-direction: column; align-items: flex-end;"> <div>✓ 8 550</div> <div>✓ antwoord</div> <div>✓ <math>i = \frac{0,08}{4}</math></div> <div>✓ <math>n = 20</math></div> <div>✓ antwoord</div> <div>✓ keuse gemaak</div> <div>(6)</div> </div>

7.3

 $F_v$  = aanvanklike deposito met rente + annuïteit

$$= 1\,000 \left( 1 + \frac{0,15}{12} \right)^{18} + 700 \left( \frac{\left( 1 + \frac{0,15}{12} \right)^{18} - 1}{\frac{0,15}{12}} \right)$$

$$= 1\,250,58 + 1\,4032,33$$

$$= \text{R}15\,282,91$$

**OF** $F_v$  = aanvanklike deposito met rente + annuïteit

$$= 1\,000 \left( 1 + \frac{0,15}{12} \right)^{18} + 700 \left( \frac{1 - \left( 1 + \frac{0,15}{12} \right)^{-18}}{\frac{0,15}{12}} \right) \left( 1 + \frac{0,15}{12} \right)^{18}$$

$$= 1\,250,58 + 11\,220,68 \left( 1 + \frac{0,15}{12} \right)^{18}$$

$$= 1\,250,58 + 1\,4032,33$$

$$= \text{R}15\,282,91$$

**OF**

$$F_v = 300 \left( 1 + \frac{0,15}{12} \right)^{18} + 700 \left( \frac{\left( 1 + \frac{0,15}{12} \right)^{19} - 1}{\frac{0,15}{12}} \right)$$

$$= 375,17 + 14\,907,74$$

$$= \text{R}15\,282,91$$

$$\checkmark i = \frac{0,15}{12} \text{ or } \frac{1}{80} \text{ or } 0,0125$$

$$\checkmark n = 18$$

$$\checkmark n = 18$$

$$\checkmark 1\,000 \left( 1 + \frac{0,15}{12} \right)^{18}$$

$$\checkmark 700 \left( \frac{\left( 1 + \frac{0,15}{12} \right)^{18} - 1}{\frac{0,15}{12}} \right)$$

✓ antwoord

(6)

$$\checkmark i = \frac{0,15}{12} \text{ or } \frac{1}{80} \text{ or } 0,0125$$

$$\checkmark n = 18$$

$$\checkmark n = 18$$

$$\checkmark 1\,000 \left( 1 + \frac{0,15}{12} \right)^{18}$$

$$\checkmark 700 \left( \frac{1 - \left( 1 + \frac{0,15}{12} \right)^{-18}}{\frac{0,15}{12}} \right) \left( 1 + \frac{0,15}{12} \right)^{18}$$

✓ antwoord

(6)

$$\checkmark i = \frac{0,15}{12} \text{ or } \frac{1}{80} \text{ or } 0,0125$$

$$\checkmark n = 19 \text{ (ten opsigte van } 700) \text{ EN}$$

$$\checkmark n = 18 \text{ (ten opsigte van } 300)$$

$$\checkmark 300 \left( 1 + \frac{0,15}{12} \right)^{18}$$

$$\checkmark 700 \left( \frac{\left( 1 + \frac{0,15}{12} \right)^{19} - 1}{\frac{0,15}{12}} \right)$$

✓ antwoord

(6)

**[16]**

**VRAAG 8**

8.1	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{-4(x+h)^2 - (-4x^2)}{h}$ $= \lim_{h \rightarrow 0} \frac{-4(x^2 + 2xh + h^2) + 4x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{-4x^2 - 8xh - 4h^2 + 4x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{-8xh - 4h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-8x - 4h)}{h}$ $= \lim_{h \rightarrow 0} (-8x - 4h)$ $= -8x$ <p><b>OF</b></p> $f(x) = -4x^2$ $f(x+h) = -4(x+h)^2$ $= -4x^2 - 8xh - 4h^2$ $f(x+h) - f(x) = -8xh - 4h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{-8xh - 4h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-8x - 4h)}{h}$ $= \lim_{h \rightarrow 0} (-8x - 4h)$ $= -8x$ <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>Let wel:</b> Verkeerde notasie:  Geen lim geskryf: penaliseer 2 punte  lim voor gelyk aan teken: penaliseer 1 punt</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>Let wel:</b> As kandidaat slegs -8x as antwoord gee 0/5 punte</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>Let wel:</b> As kandidaat die hakkies uitlaat in <math>\lim_{h \rightarrow 0} (-8x - 4h)</math> Geen penalisering</p> </div>	<p>✓ formule</p> <p>✓ substitusie</p> <p>✓ uitbreiding</p> <p>✓ <math>-8x - 4h</math></p> <p>✓ antwoord (5)</p> <p>✓ substitusie</p> <p>✓ uitbreiding</p> <p>✓ formule</p> <p>✓ <math>-8x - 4h</math></p> <p>✓ antwoord (5)</p>
8.2.1	$y = \frac{3}{2x} - \frac{x^2}{2}$ $= \frac{3}{2}x^{-1} - \frac{1}{2}x^2$ $\frac{dy}{dx} = -\frac{3}{2}x^{-2} - x$ $= -\frac{3}{2x^2} - x$ <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>Let wel:</b> Verkeerde notasie in 8.2.1 en/of 8.2.2: Penaliseer 1 punt</p> </div>	<p>✓ <math>\frac{3}{2}x^{-1}</math></p> <p>✓ <math>-\frac{3}{2}x^{-2}</math></p> <p>✓ <math>-x</math></p> <p>(3)</p>

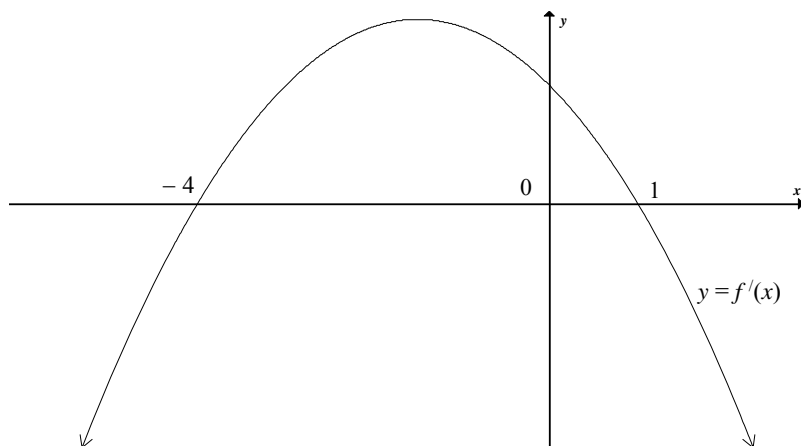
8.2.2	$f(x) = (7x + 1)^2$ $= 49x^2 + 14x + 1$ $f'(x) = 98x + 14$ $f'(1) = 98(1) + 14$ $= 112$ <p><b>OF</b></p> $f(x) = (7x + 1)^2$ $f'(x) = 2(7x + 1).(7) \quad \text{Deur die kettingreël}$ $f'(x) = 98x + 14$ $f'(1) = 98(1) + 14$ $= 112$	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p><b>Let wel:</b> Verkeerde notasie in 8.2.1 en/of 8.2.2: Penaliseer 1 punt</p> </div> <p>✓ vermenigvuldiging ✓ <math>98x</math> ✓ 14 ✓ antwoord (4)</p> <p>✓✓ kettingreël</p> <p>✓✓ antwoord (4) <b>[12]</b></p>
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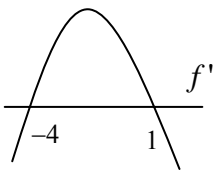
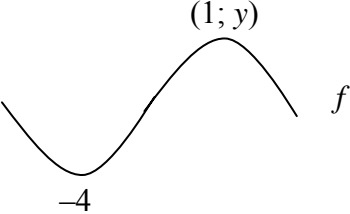
**VRAAG 9**

9.1	$f(x) = -2x^3 + ax^2 + bx + c$ $f'(x) = -6x^2 + 2ax + b$ $= -6(x-5)(x-2)$ $= -6(x^2 - 7x + 10)$ $= -6x^2 + 42x - 60$ $2a = 42$ $a = 21$ $b = -60$ $f(5) = -2(5)^3 + 21(5)^2 - 60(5) + c$ $18 = -25 + c$ $c = 43$ $a = 21 ; b = -60 ; c = 43$ <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>Let wel:</b> Indien kandidaat die waardes van <math>a</math>, <math>b</math> en <math>c</math> vervang en dan toets (deur vervanging) dat <math>T(2; -9)</math> en <math>S(5; 18)</math> op die kurwe lê : Maks 2/7 punte</p> </div> <div style="margin-top: 10px;"> <p><b>OF</b></p> <math display="block">f(2) = -2(2)^3 + 21(2)^2 - 60(2) + c</math> <math display="block">-9 = -52 + c</math> <math display="block">c = 43</math> </div>	$\checkmark f'(x) = -6x^2 + 2ax + b$ $\checkmark \checkmark -6(x-5)(x-2)$ $\checkmark 2a = 42$ $\checkmark b = -60$ $\checkmark \text{subs } (5 ; 18) \text{ of } (2; -9)$ $\checkmark c = 43$ <p style="text-align: right;">(7)</p>
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p><b>Let wel:</b> Indien kandidaat die waardes van <math>a</math>, <math>b</math> en <math>c</math> in die funksie vervang en die volgende kry <math>f(x) = -2x^3 - 21x^2 - 60x + 43</math> en deur substitusie wys dat <math>T(2; -9)</math> and <math>S(5; 18)</math> op die grafiek lê <b>en</b> dan die afgeleide uitwerk en <math>f'(x) = -6x^2 - 42x - 60</math> kry en deur vervanging in die afgeleide wys dat die draaipunte by <math>x = 2</math> en <math>x = 5</math> is (neem aan wat hy moet bewys en bewys wat gegee is): <b>Maksimum 4/7 punte</b> soos aangedui:  <math>\checkmark x = 2</math> van <math>f'(x) = 0</math> OF vervang <math>x = 2</math> in die afgeleide en 0 kry  <math>\checkmark x = 5</math> van <math>f'(x) = 0</math> OF vervang <math>x = 5</math> in die afgeleide en 0 kry  <math>\checkmark</math> vervang <math>x = 2</math> in <math>f</math> en kry <math>-9</math>  <math>\checkmark</math> vervang <math>x = 5</math> in <math>f</math> en kry <math>-9</math></p> </div> <div style="margin-bottom: 10px;"> <p><b>OF</b></p> <math display="block">f'(x) = -6x^2 + 2ax + b</math> <math display="block">f'(2) = -6(2)^2 + 2a(2) + b</math> <math display="block">0 = -24 + 4a + b</math> <math display="block">b = 24 - 4a</math> <math display="block">f'(5) = -6(5)^2 + 2a(5) + b</math> <math display="block">0 = -150 + 10a + b</math> <math display="block">0 = -150 + 10a + (24 - 4a)</math> <math display="block">0 = -126 + 6a</math> <math display="block">6a = 126</math> <math display="block">a = 21</math> <math display="block">b = -60</math> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>Let wel:</b> Indien afgeleide gelyk aan 0 nie aangedui, penaliseer slegs een keer</p> </div>	$\checkmark f'(x) = -6x^2 + 2ax + b$ $\checkmark f'(2) = 0$ $\checkmark f'(5) = 0$ $\checkmark 6a = 126$ $\checkmark b = -60$

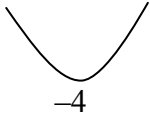
	$f(5) = -2(5)^3 + 21(5)^2 - 60(5) + c$ $18 = -25 + c$ $c = 43$  $a = 21 ; b = -60 ; c = 43$  <b>OR</b>  $f(2) = -9$ i.e. $-16 + 4a + 2b + c = -9$ $4a + 2b + c = 7$ $f(5) = 18$ i.e. $-250 + 25a + 5b + c = 18$ $25a + 5b + c = 268$ $21a + 3b = 261$  $f'(x) = -6x^2 + 2ax + b$ en $f'(2) = 0$ OF $f'(5) = 0$ $4a + b = 24$ $10a + b = 150$  $12a + 3b = 72$ $30a + 3b = 450$ $9a = 189$ $9a = 189$ $a = \frac{189}{9}$ OF $a = \frac{189}{9}$ $a = 21$ $a = 21$  $12(21) + 3b = 72$ $3b = -180$ $b = -60$  $4a + 2b + c = 7$ $25a + 5b + c = 268$ $4(21) + 2(-60) + c = 7$ OF $25(21) + 5(-60) + c = 268$ $c = 43$ $c = 43$	$\checkmark$ subs (5 ; 18) of (2; -9) $\checkmark c = 43$  (7)   $\checkmark -16 + 4a + 2b + c = -9$ en $-250 + 25a + 5b + c = 18$  $\checkmark f'(x) = -6x^2 + 2ax + b$ $\checkmark f'(2) = 0$ of $f'(5) = 0$  $\checkmark 9a = 189$  $\checkmark b = -60$  $\checkmark$ subs (5 ; 18) of (2 ; -9) $\checkmark c = 43$ (7)
9.2	$f'(x) = -6x^2 + 42x - 60$ $m_{raaklyn} = -6(1)^2 + 42(1) - 60$ $= -24$ $f(1) = -2(1)^3 + 21(1)^2 - 60(1) + 43$ $= 2$ Raakpunt is (1 ; 2)  $y - 2 = -24(x - 1)$ $y = -24x + 26$	$\checkmark$ $f'(x) = -6x^2 + 42x - 60$ $\checkmark$ subs $f'(1)$ $\checkmark m_{raaklyn} = -24$ $\checkmark f(1) = 2$  $\checkmark y - 2 = -24(x - 1)$ OF $y = -24x + 26$ (5)

9.3	$f'(x) = -6x^2 + 42x - 60$ $f''(x) = -12x + 42$ $0 = -12x + 42$ $x = \frac{7}{2}$ <p><b>OF</b></p> $x = \frac{2+5}{2}$ $x = \frac{7}{2}$ <p><b>OF</b></p> $x = \frac{-21}{3(-2)}$ $= \frac{7}{2}$	$\checkmark f''(x) = -12x + 42$ $\checkmark x = \frac{7}{2}$ <p>(2)</p> $\checkmark x = \frac{2+5}{2}$ $\checkmark x = \frac{7}{2}$ <p>(2)</p> $\checkmark x = \frac{-21}{3(-2)}$ $\checkmark x = \frac{7}{2}$ <p>[14]</p>
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**VRAAG 10**

10.1	$x\text{-waarde van die draaipunt:}$ $x = \frac{-4+1}{2}$ $= -\frac{3}{2}$ $\therefore x > -\frac{3}{2} \quad \text{OF} \quad x \in \left(-\frac{3}{2}; \infty\right)$	$\checkmark x > -\frac{3}{2} \quad \text{OF}$ $x \in \left(-\frac{3}{2}; \infty\right)$ <p>(1)</p>
10.2	$f$ het lokale minimum by $x = -4$ omdat: <div style="display: flex; justify-content: space-around; align-items: center;">   </div>	$\checkmark x = -4$ $\checkmark \checkmark \text{ graph}$ <p>(3)</p>



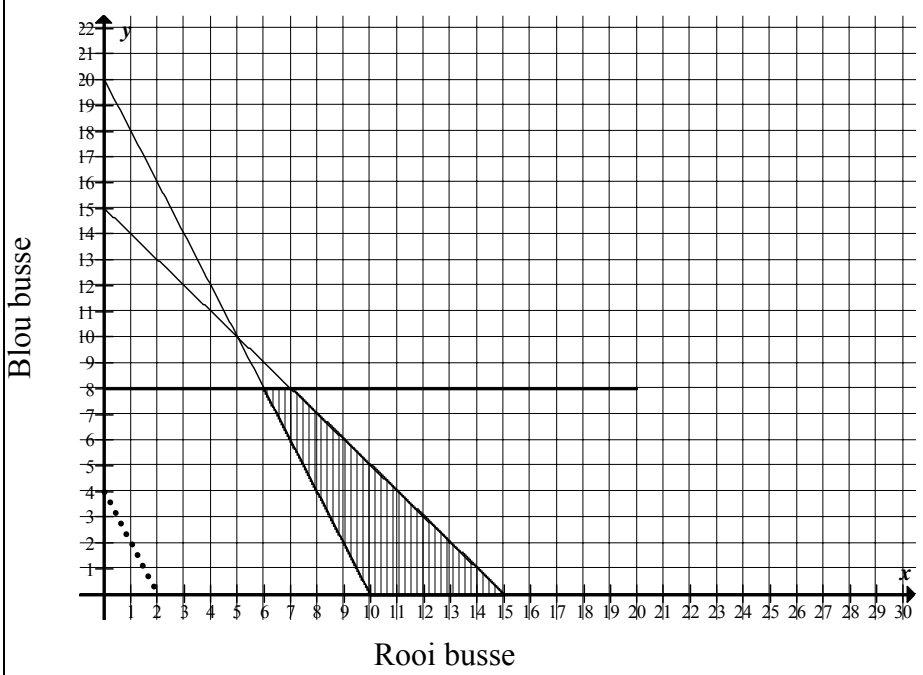
	<p><b>OF</b>  <math>f'(x) &lt; 0</math> vir <math>x &lt; -4</math>, so <math>f</math> is dalend vir <math>x &lt; -4</math>.  <math>f'(x) &gt; 0</math> vir <math>-4 &lt; x &lt; 1</math>, so <math>f</math> is stygend vir <math>-4 &lt; x &lt; 1</math>.</p> <p>i.e.  <math>\therefore f</math> het 'n lokale minimum by <math>x = -4</math></p> <p><b>OF</b>          Gradiënt van <math>f</math> verander van negatief na positief by <math>x = -4</math></p> <p><b>OF</b>  <math>f'(-4) = 0</math>  <math>f''(-4) &gt; 0</math> grafiek is konkaaf na bo by <math>x = -4</math>, so <math>f</math> het 'n lokale minimum by <math>x = -4</math>.</p>	<p>✓ <math>x = -4</math>          ✓ <math>f'(x) &lt; 0</math> vir <math>x &lt; -4</math>          ✓ <math>f'(x) &gt; 0</math> vir <math>-4 &lt; x &lt; 1</math> (3)</p> <p>✓ <math>x = -4</math>          ✓ gradient negatief vir <math>x &lt; -4</math>          ✓ gradient positief vir <math>-4 &lt; x &lt; 1</math> (3)</p> <p>✓ <math>f'(-4) = 0</math>          ✓ <math>f''(-4) &gt; 0</math>          ✓ <math>x = -4</math> (3)</p> <p>[4]</p>
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**VRAAG 11**

11.1	$V(0) = 100 - 4(0)$ $= 100$ liter	✓ antwoord (1)
11.2	Tempo in – tempo uit $= 5 - k$ l/min $V'(t) = -4$ l/min	✓ $5 - k$ ✓ $-4$ ✓ eenhede een keer aangedui (3)
11.3	$5 - k = -4$ $k = 9$ l/min <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-top: 10px;"> <b>Let wel:</b> Slegs antwoord:            2/2 punte         </div> <p><b>OF</b></p> <p>Volume vir enige gegewe <math>t</math> = aanvanklike volume + inkomende totaal – uitgaande totaal  <math>100 + 5t - kt = 100 - 4t</math>  <math>5t - kt = -4t</math>  <math>9t - kt = 0</math>  <math>t(9 - k) = 0</math></p> <p>As <math>t = 1</math> minuut vanaf die begin, <math>t = 1</math>, <math>9 - k = 0</math>,          so <math>k = 9</math></p> <p><b>OF</b></p> <p>Aangesien <math>\frac{dV}{dt} = -4</math>, verminder die volume van die water in die tenk met 4 liters per minuut. Dus moet <math>k</math>, 4 meer wees as 5: <math>k = 9</math>.</p>	<p>✓ <math>5 - k = -4</math>          ✓ <math>k = 9</math> (2)</p> <p>✓ <math>100 + 5t - kt = 100 - 4t</math></p> <p>✓ <math>k = 9</math> (2)</p> <p>✓✓ <math>k = 9</math> (2)</p> <p>[6]</p>

**VRAAG 12**

**Let wel:** Indien die verkeerde ongelijkheid  $50x + 25y \leq 500$  gebruik word, het die kandidaat verkeerdlik gesê dat daar meer leerlinge is as beskikbare sitplekke. 'n Maksimum van **10** punte vir die hele vraag kan dan toegeken word:

12.1	$x, y \in \mathbb{N}$ $x + y \leq 15$ $50x + 25y \geq 500$ $y \leq 8$ <b>OF</b> $y \leq -x + 15$ $y \geq -2x + 20$ $y \leq 8$ <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <b>Let wel:</b> Die punt vir die ongelijkheid kan slegs toegeken word indien beide LK en RK korrek is         </div>	<div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <b>Let wel:</b> Indien die kandidaat <math>50x + 25y = 500</math> het: Maksimum 5/6 punte         </div> $\checkmark\checkmark x + y \leq 15$ $\checkmark\checkmark y \leq 8$ $\checkmark\checkmark 50x + 25y \geq 500$ <div style="text-align: right;">(6)</div>
12.2		$\checkmark x + y \leq 15$ $\checkmark 50x + 25y \geq 500$ $\checkmark y \leq 8$ $\checkmark$ gangbare gebied <div style="text-align: right;">(4)</div>
12.3	$C = 600x + 300y$	$\checkmark$ antwoord <div style="text-align: right;">(1)</div>
12.4.1	$(6 ; 8) ; (7 ; 6) ; (8 ; 4) ; (9 ; 2)$ en $(10 ; 0)$ <b>LET WEL:</b> Die gradiënt van die soeklyn is $m = -\frac{2}{1}$	3 punte indien al die oplossings korrek 2 punte indien 3 of 4 oplossings korrek 1 punte indien 1 of 2 oplossings korrek <div style="text-align: right;">(3)</div>
12.4.2	$C = 6(600) + 8(300) = \text{R}6\,000$ of $C = 7(600) + 6(300) = \text{R}6\,000$ of $C = 8(600) + 4(300) = \text{R}6\,000$ of $C = 9(600) + 2(300) = \text{R}6\,000$ of $C = 10(600) + 0(300) = \text{R}6\,000$	$\checkmark$ subs $\checkmark$ antwoord <div style="text-align: right;">(2)</div>
12.5	8 rooi ; 4 blou	$\checkmark$ antwoord <div style="text-align: right;">(1)</div>

**TOTAAL: 150**

**VRAAG 12.2**