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# **JUNIE EKSAMEN GRAAD 12**

**2025**

## **NASIENRIGLYNE**

**WISKUNDE**

**(VRAESTEL 1)**

**22 bladsye**



**SA EXAM PAPERS**

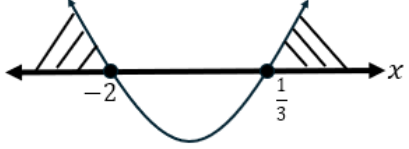
Proudly South African

**ALGEMENE NOTAS**

1. CA geld in hierdie nasienriglyn.
2. As 'n leerder 'n vraag twee keer beantwoord, maar nie een van die antwoorde kanselleer nie, merk **SLEGS** die eerste poging.
3. As 'n leerder die antwoord kanselleer, maar nie 'n tweede poging doen nie, merk die gekanselleerde poging.
4. Indien 'n leerder 'n antwoord gee het wat nie in hierdie memorandum beskryf word nie, evalueer dit eers voordat sy poging gediskwalifiseer word. Gaan asseblief deur alle **OPSIES** wat in hierdie nasienriglyn verskaf word.

| <b>VRAAG 1</b> |                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                            |     |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.1.1          | $x(x + 4) = 0$<br>$x = 0$ of $x = -4$ <div style="border: 1px solid black; padding: 5px; display: inline-block;">ANTWOORD ALLEEN <math>\frac{1}{2}</math></div>                                                                                                                                                            | ✓ faktore<br>✓ beide waardes van $x$                                                                                                                                                                                                       | (2) |
| 1.1.2          | $2x^2 - 3x - \frac{1}{2} = 0$<br>$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-\frac{1}{2})}}{2(2)}$<br>$x = \frac{3 \pm \sqrt{13}}{4}$<br>$x = 1,65$ or $x = -0,15$<br><br>OF<br>$4x^2 - 6x - 1 = 0$<br>$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(4)(-1)}}{2(4)}$<br>$x = \frac{6 \pm \sqrt{52}}{8}$<br>$x = 1,65$ of $x = -0,15$ | ✓ standaard vorm<br>✓ substitusie<br>✓ 1,65<br>✓ -0,15<br><br><div style="border: 1px solid black; padding: 5px; display: inline-block;"> ANTWOORD ALLEEN <math>\frac{2}{4}</math><br/> <b>Penaliseer 1 punt vir afronding fout</b> </div> | (4) |



|       |                                                                                                                                                 |                                                                                                                                        |     |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.1.3 | $3x^2 + 5x - 2 \geq 0$<br>$(3x - 1)(x + 2) = 0$<br>Kritiese waardes<br>$x = \frac{1}{3}$ en $x = -2$<br><br>$x \leq -2$ or $x \geq \frac{1}{3}$ | <ul style="list-style-type: none"> <li>✓ standaard vorm</li> <li>✓ faktore</li> <li>✓ kritiese waardes</li> <li>✓ antwoorde</li> </ul> | (4) |
|       |                                                                |                                                                                                                                        |     |



|       |                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                         |     |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.1.4 | $2^{2x} + 2^x - 6 = 0$<br>Laat $k = 2^x$<br>$k^2 + k - 6 = 0$<br>$(k + 3)(k - 2) = 0$<br>$k \neq -3$ of $k = 2$<br>$2^x = 2$<br>$x = 1$<br><b>OF/OF</b><br>$(2^x + 3)(2^x - 2) = 0$<br>$2^x \neq -3$ of $2^x = 2$<br>$x = 1$                                                                                                                                                   | ✓ faktore<br>✓ verwerping<br>✓ antwoord<br><br><br><br><br><br><br><br><br><br><br><b>OF</b><br>✓ faktore<br>✓ verwerping<br>✓ antwoord | (3) |
| 1.1.5 | $x^2 - 2x - 3 + \frac{2}{x^2 - 2x} = 0$<br>$k = x^2 - 2x$<br>$k + 3 + \frac{2}{k} = 0$<br>$k(k + 3) + 2 = 0$<br>$k^2 + 3k + 2 = 0$<br>$(k + 1)(k + 2) = 0$<br>$k = -2$ of $k = -1$<br><br>$x^2 - 2x = -1$<br>$x^2 - 2x + 1 = 0$<br>$(x - 1)^2 = 0$<br>$x = 1$<br><br>$x^2 - 2x + 2 = 0$<br>$\Delta = b^2 - 4ac$<br>$= (-2)^2 - 4(1)(2)$<br>$\Delta = -4$ (Diskriminant $< 0$ ) | ✓ k-metode<br>✓ faktore<br>✓ verwerping/diskriminant<br>✓ antwoord                                                                      | (4) |

ANTWOORD ALLEEN  $\frac{1}{3}$ 



|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                             |     |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.1.6 | $(\sqrt{x+5})^2 = (x-1)^2$<br>$x+5 = x^2 - 2x + 1$<br>$x^2 - 3x - 4 = 0$<br>$(x-4)(x+1) = 0$<br>$x \neq -1 \text{ of } x = 4$                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ✓ kwadreeer beide kante<br>✓ standaard vorm<br>✓ faktore<br>✓ antwoord/seleksie                                                                             | (4) |
| 1.2   | $x + 2y = 5 \text{ en } 2y^2 - xy - 4x^2 = 8$<br>Uit vergelyking 1<br>$x = 5 - 2y \dots \dots (3)$<br>Vervang (3) in (2)<br>$2y^2 - xy - 4x^2 = 8$<br>$2y^2 - y(5 - 2y) - 4(5 - 2y)^2 - 8 = 0$<br>$2y^2 - 5y + 2y^2 - 100 + 80y - 16y^2 - 8 = 0$<br>$-12y^2 + 75y - 108 = 0$<br>$\frac{-12y^2}{-3} + \frac{75y}{-3} - \frac{108}{-3} = 0$<br>$4y^2 - 25y + 36 = 0$<br>$(4y - 9)(y - 4) = 0$<br>$y = \frac{9}{4} \text{ of } y = 4$<br>Wanneer $y = \frac{9}{4}$<br>$x = 5 - 2y$<br>$x = 5 - 2(\frac{9}{4})$<br>$x = \frac{1}{2}$<br>Wanneer $y = 4$<br>$x = 5 - 2y$<br>$x = 5 - 2(4)$<br>$x = -3$ | ✓ $x = 5 - 2y$ vergelyking 3<br>✓ subt van vergelyking<br>3 in vergelyking 2<br>✓ standaard vorm<br>✓ faktore<br>✓ beide $y$ waardes<br>✓ beide $x$ waardes | (6) |





|     |                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                               |      |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1.3 | $6x^2 - 4kx + 6 = 0$<br>$\Delta = b^2 - 4ac$<br>$\Delta = (-4k)^2 - (4)(6)(6)$<br>$= 16k^2 - 144$<br>$16k^2 - 144 = 0$<br>$\frac{16k^2}{16} = \frac{144}{16}$<br>$k^2 = 9$<br>$k = \pm\sqrt{9}$<br>$k = \pm 3$<br><p>Daarom is die waardes van k waarvoor die wortels reëel en gelyk is, :</p> $k = 3$ of $k = -3$ | <ul style="list-style-type: none"> <li>✓ korrekte gebruik van 'n formule van <math>\Delta</math></li> <li>✓ vereenvoudiging</li> <li>✓ antwoorde en gevolgtrekking</li> </ul> | (3)  |
|     |                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                               | [30] |

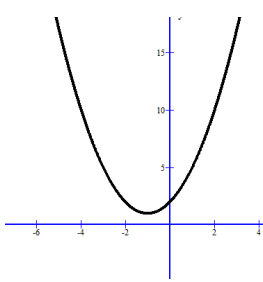




| VRAAG 2 |                                                                                                                                                                                                                                                                                                                                                                              |                                                                              |     |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-----|
| 2.1.1   | 16 ; 23                                                                                                                                                                                                                                                                                                                                                                      | ✓ 16<br>✓ 23                                                                 | (2) |
| 2.1.2   | $S_n = \frac{n}{2}[2a + (n-1)d]$ $S_n = \frac{n}{2}[2(-5) + (n-1)7]$ $S_n = \frac{n}{2}(-10 + 7n - 7)$ $S_n = \frac{n}{2}(7n - 17)$                                                                                                                                                                                                                                          | ✓ subt van a<br>✓ en d<br>✓ vereenvoudiging                                  | (3) |
| 2.2.1   | <p> <math>x</math>                  <math>3x - 5</math>                  <math>4x - 3</math>                  <math>5x + 1</math> </p> <p> <math>2x - 5</math>                  <math>x + 2</math>                  <math>x + 4</math> </p> <p> <math>-x + 7</math>                  <math>2</math> </p> <p> <math>-x + 7 = 2</math><br/> <math>\therefore x = 5</math> </p> | ✓ eerste verskil<br>✓ tweede verskil<br>✓ 5                                  | (3) |
| 2.2.2   | $2a = 2$ $3(1) + b = 5$<br>$\therefore a = 1$ $\therefore b = 5 - 3 = 2$<br>$1 + 2 + c = 5$<br>$\therefore c = 5 - 3 = 2$<br>$T_n = n^2 + 2n + 2$<br>$= n^2 + 2n + 1 + 1$<br>$= (n + 1)^2 + 1$<br>Gevolgtrekking:<br>$(n + 1)^2$ is altyd positief vir almal $n \geq 1$ en as 1 by<br>getel word, sal die resultaat positief bly.                                            | ✓ $a = 1$<br>✓ $b = 2$<br>✓ $c = 2$<br>✓ $(n + 1)^2 + 1$<br>✓ verduideliking | (5) |





|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                          |  |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <p>OF</p> $2a = 2$ $\therefore a = 1$ $1 + 2 + c = 5$ $\therefore c = 5 - 3 = 2$ $T_n = n^2 + 2n + 2$ <p><math>n \in N</math> gevolglik is <math>T_n</math> positief vir alle waardes van <math>n</math></p> <p>OF</p> $2a = 2$ $\therefore a = 1$ $1 + 2 + c = 5$ $\therefore c = 5 - 3 = 2$ $T_n = n^2 + 2n + 2$  <p>Gevolglik is alle term positief vir alle waardes van <math>n</math></p> | <p>✓ <math>a = 1</math></p> <p>✓ <math>b = 2</math></p> <p>✓ <math>c = 2</math></p> <p>✓ <math>n \in N</math></p> <p>✓ verduideliking</p><br><p><math>a = 1</math></p> <p>✓ <math>b = 2</math></p> <p>✓ <math>c = 2</math></p> <p>✓ Grafiese</p> <p>✓ verduideliking</p> |  |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|



|       |                                                                                                                                                                                                                                                     |                                                                                                                                                                     |             |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 2.3.1 | $r = \frac{\frac{3}{4}(p-3)^2}{\frac{1}{2}(p-3)} = \frac{3(p-3)}{2}$ <p>Sal konvergeer indien :</p> $-1 < r < 1; r \neq 0$ $-1 < \frac{3(p-3)}{2} < 1$ $-2 < 3(p-3) < 2$ $-2 < 3p - 9 < 2$ $7 < 3p < 11$ $\frac{7}{3} < p < \frac{11}{3}; p \neq 3$ | <p>✓ <math>r</math>, i n terme van <math>p</math></p> <p>✓ sub t in formule</p> <p>✓ vereenvoudiging</p> <p>✓ <math>\frac{7}{3} &lt; p &lt; \frac{11}{3}</math></p> | (4)         |
| 2.3.2 | $S_{\infty} = \frac{a}{1-r}$ $1 = \frac{\frac{1}{2}(p-3)}{1 - \left(\frac{3(p-3)}{2}\right)}$ $\left(1 - \frac{3p-9}{2}\right) = \frac{1}{2}(p-3)$ $\frac{11-3p}{2} = \frac{p-3}{2}$ $4p = 14$ $p = \frac{14}{4} = \frac{7}{2}$                     | <p>✓ sub t in korrekte formule</p> <p>✓ vereenvoudiging</p> <p>✓ <math>\frac{7}{2}</math></p>                                                                       | (3)         |
|       |                                                                                                                                                                                                                                                     |                                                                                                                                                                     | <b>[20]</b> |





## VRAAG 3

3.1

$$\sum_{k=2}^n 2(3^{k-1}) = 59\,046.$$

$$6 + 18 + 54 + \dots + 2(3^{n-1}) = 59\,046$$

$$r = \frac{18}{6} = 3$$

$$\text{Aantal terme}(n - 2) + 1 = n - 1$$

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

$$S_{n-1} = \frac{6(3^{n-1} - 1)}{3 - 1}$$

$$\frac{6(3^{n-1} - 1)}{3 - 1} = 59\,046$$

$$3(3^{n-1} - 1) = 59\,046$$

$$3^{n-1} - 1 = 19\,682$$

$$3^{n-1} = 19\,683$$

$$3^{n-1} = 3^9$$

$$n - 1 = 9$$

$$\therefore n = 10$$

OF

$$\sum_{k=2}^n 2(3^{k-1}) = 59\,046.$$

$$6 + 18 + 54 + \dots + 2(3^{n-1}) = 59\,046$$

$$r = \frac{18}{6} = 3$$

$$\text{Aantal terme}(n - 2) + 1 = n - 1$$

$$\text{Stel } k \text{ die aantal terme}$$

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

$$S_k = \frac{6(3^k - 1)}{3 - 1}$$

$$\frac{6(3^k - 1)}{3 - 1} = 59\,046$$

$$3(3^k - 1) = 59\,046$$

$$3^k - 1 = 19\,682$$

$$3^k = 19\,683$$

$$3^k = 3^9$$

$$k = 9$$

$$\therefore n - 1 = 9$$

$$\Rightarrow n = 10$$

- ✓  $r = 3$
- ✓  $n - 1$
- ✓ substitusie
- ✓ vereenvoudiging tot  $3^{n-1} = 19\,683$
- ✓ 10

Of

- ✓  $r = 3$
- ✓  $n - 1$
- ✓ substitusie
- ✓ vereenvoudiging tot  $3^k = 19\,683$
- ✓ 10

(5)



|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                    |                                              |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| 3.2.1 | 6p                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ✓ 6p                                                                                                                                                                                               | (1)                                          |
| 3.2.2 | <p>Stelling van Pythagoras</p> $h^2 = (12p)^2 - (6p)^2$ $h^2 = 144p^2 - 36p^2$ $h^2 = 108p^2$ $\therefore h = 6\sqrt{3}p \text{ eenhede}$ <p><b>OF</b></p> $\sin 60^\circ = \frac{h}{12p}$ $h = 12p \cdot \frac{\sqrt{3}}{2}$ $\therefore h = 6\sqrt{3}p \text{ eenhede}$                                                                                                                                                                                                                                                                                                             | <p>✓ stelling van Pythagoras</p> <p>✓ <math>6\sqrt{3}p</math></p><br><p>✓ trig verhouding</p> <p>✓ <math>6\sqrt{3}p</math></p>                                                                     | <p>(2)</p><br><p><b>OF</b></p><br><p>(2)</p> |
| 3.2.3 | <p>Oppervlakte van die eerste driehoek =</p> $\frac{1}{2}(12p)(6\sqrt{3}p) = 36\sqrt{3}p^2$ <p>Oppervlakte van die tweede driehoek =</p> $\frac{1}{2}(6p)(3\sqrt{3}p) = 9\sqrt{3}p^2$ <p>Oppervlakte van die derde driehoek = <math>\frac{1}{2}(3p) \cdot \frac{1}{2}(3\sqrt{3}p)</math></p> $= \frac{9\sqrt{3}p^2}{4}$<br>$36\sqrt{3}p^2 + 9\sqrt{3}p^2 + \frac{9\sqrt{3}p^2}{4} \dots$ <p>Meetkundige patroon</p> $r = \frac{9\sqrt{3}p^2}{36\sqrt{3}p^2} = \frac{1}{4}$<br>$S_\infty = \frac{a}{1-r}; r \neq 1$ $S_\infty = \frac{36\sqrt{3}p^2}{1 - \frac{1}{4}} = 48\sqrt{3}p^2$ | <p>✓ <math>36\sqrt{3}p^2</math></p> <p>✓ <math>9\sqrt{3}p^2</math></p> <p>✓ <math>\frac{9\sqrt{3}p^2}{4}</math></p> <p>✓ <math>\frac{1}{4}</math></p> <p>✓ substitusie in die korrekte formule</p> |                                              |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                               |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <p><b>OF</b></p> <p>Oppervlakte van die eerste driehoek=<br/> <math>\frac{1}{2}(12p)(6\sqrt{3}p) = 36\sqrt{3}p^2</math></p> <p>Verhouding van ooreenstemmende sye van<br/> opeenvolgende driehoeke= 1:2</p> <p>Verhouding van oppervlaktes van opeenvolgende<br/> driehoeke= 1:4</p> <p><math>\therefore r = \frac{1}{4}</math></p> <p><math>S_{\infty} = \frac{a}{1-r}; r \neq 1</math></p> <p><math>S_{\infty} = \frac{36\sqrt{3}p^2}{1-\frac{1}{4}} = 48\sqrt{3}p^2</math></p> <p><b>OF</b></p> <p><b>Gebruik oppervlakte reël.</b></p> <p>Oppervlakte van die eerste driehoek=<br/> <math>\frac{1}{2}(12p)(12p)\sin 60^{\circ}</math></p> <p><math>= 36\sqrt{3}p^2</math></p> <p>Oppervlakte van die tweede driehoek=<br/> <math>\frac{1}{2}(6p)(6p)\sin 60^{\circ}</math></p> <p><math>= 9\sqrt{3}p^2</math></p> <p>Oppervlakte van die derde driehoek=<br/> <math>\frac{1}{2}(3p)(3p)\sin 60^{\circ}</math></p> <p><math>= \frac{9\sqrt{3}p^2}{4}</math></p> <p><math>36\sqrt{3}p^2 + 9\sqrt{3}p^2 + \frac{9\sqrt{3}p^2}{4} \dots</math></p> <p>Meetkundige patroon</p> <p><math>r = \frac{9\sqrt{3}p^2}{36\sqrt{3}p^2} = \frac{1}{4}</math></p> <p><math>S_{\infty} = \frac{a}{1-r}; r \neq 1</math></p> <p><math>S_{\infty} = \frac{36\sqrt{3}p^2}{1-\frac{1}{4}} = 48\sqrt{3}p^2</math></p> | <p><b>OF</b></p> <p>✓ <math>36\sqrt{3}p^2</math></p> <p>✓ 1:2</p> <p>✓ 1:4</p> <p>✓ <math>\frac{1}{4}</math></p> <p>✓ substitusie in korrekte formule</p> <p><b>of</b></p> <p>✓ <math>36\sqrt{3}p^2</math></p> <p>✓ <math>9\sqrt{3}p^2</math></p> <p>✓ <math>\frac{9\sqrt{3}p^2}{4}</math></p> <p>✓ <math>\frac{1}{4}</math></p> <p>✓ substitusie in die korrekte formule</p> | (5)  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                               | (5)  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                               | [13] |





## VRAAG 4

|       |                                                                                                                                                                                                          |                                 |     |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----|
| 4.1   | $(0; \frac{15}{2})$<br><div>Penaliseer vir koördinaat vorm<br/>MOET in koördinaat vorm wees</div>                                                                                                        | ✓ $(0; \frac{15}{2})$           | (1) |
| 4.2   | $x^2 + 2x = 0$<br>$x(x + 2) = 0$<br>$x = 0$ of $x = -2$<br>$C(-2; 0)$<br><div>Moenie penaliseer indien<br/>koördinate vorm nie gegee word nie</div>                                                      | ✓ faktorisering<br>✓ $C(-2; 0)$ | (2) |
| 4.3.1 | $x = \frac{-b}{2a}$<br>$x = \frac{-2}{2(1)} = -1$<br>$\therefore p = -1$<br><br><b>OF</b><br>$p = \frac{0 + (-2)}{2} = -1$<br><br><b>OF</b><br>$g(x) = (x + 1)^2 - 1$<br>$x = -1$<br>$\therefore p = -1$ | ✓ $p = -1$                      | (1) |
| 4.3.2 | $g(-1) = (-1)^2 + 2(-1) = -1$<br>$y_E = -1$<br>$\therefore DE = 8 - (-1) = 9$ eenhede                                                                                                                    | ✓ $y_E = -1$<br>✓ 9             | (2) |





|     |                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                           |     |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 4.4 | $f(x) = a(x + p)^2 + q$<br>$f(x) = a(x + 1)^2 + 8$<br>Gebruik $F(0; \frac{15}{2})$<br>$a(0 + 1)^2 + 8 = \frac{15}{2}$<br>$a + 8 = \frac{15}{2}$<br>$\therefore a = -\frac{1}{2}$<br>$f(x) = -\frac{1}{2}(x + 1)^2 + 8$<br>$f(x) = -\frac{1}{2}(x^2 + 2x + 1) + 8$<br>$f(x) = -\frac{1}{2}x^2 - x - \frac{1}{2} + 8$<br>$f(x) = -\frac{1}{2}x^2 - x + \frac{15}{2}$<br>$\therefore b = -1$ | ✓ substitusie van p en q<br>gebruik punt D(1 ; 8 )<br>✓ substitusie van x en y<br>gebruik van punt F<br>$(0; \frac{15}{2})$<br>✓ vereenvoudig tot<br>$a = -\frac{1}{2}$<br>✓ vereenvoudig tot<br>$b = -1$ | (4) |
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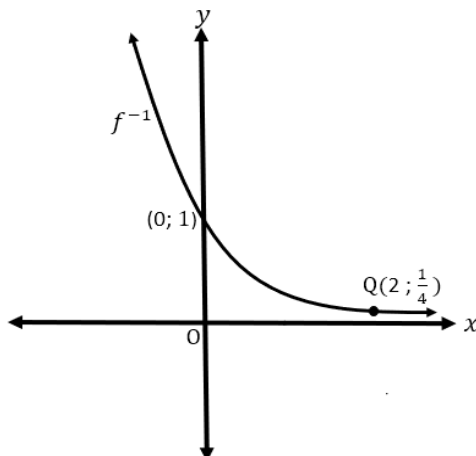


|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                           |      |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------|
| 4.5 | $-\frac{1}{2}x^2 - x - \frac{15}{2} = x^2 + 2x$ $\frac{3}{2}x^2 + 3x - \frac{15}{2} = 0$ $x^2 + 2x - 5 = 0$ $x = \frac{-2 \pm \sqrt{2^2 - 4(1)(-5)}}{2(1)}$ $x = \frac{-2 \pm \sqrt{24}}{2}$ $x = 1.45 \text{ or } x = -3.45$ $g(1.45) = (1.45)^2 + 2(1.45) = 5.00$ $g(-3.45) = (-3.45)^2 + 2(-3.45) = 5.00$ $\therefore y = 5$ <p><b>OF</b></p> $f(1.45) = -\frac{1}{2}(1.45)^2 - 1.45 - \frac{15}{2} = 5.00$ $f(-3.45) = -\frac{1}{2}(-3.45)^2 - (-3.45) - \frac{15}{2} = 5.00$ $\therefore y = 5$ | ✓ stel $f$ en $g$ gelyk<br>✓ standard vorm<br>✓ $x$ -waarde<br>✓ $y$ -waarde<br>✓ $y = 5$ | (5)  |
|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                           | [15] |

|                |                                                                                                                                             |                                       |     |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----|
| <b>VRAAG 5</b> |                                                                                                                                             |                                       |     |
| 5.1.1          | $y = \log_a x$ $2 = \log_a \frac{1}{4}$ $a^2 = \frac{1}{4}$ $a = \pm \sqrt{\frac{1}{4}}$ $a = \pm \frac{1}{2}$ $\therefore a = \frac{1}{2}$ | ✓ substitution<br>✓ $a = \frac{1}{2}$ | (2) |





|       |                                                                                                                          |                                                                        |                                                                                                            |      |
|-------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|------|
| 5.1.2 | $y = \log_{\frac{1}{2}} x$<br>$x = \log_{\frac{1}{2}} y$<br>$y = \left(\frac{1}{2}\right)^x$                             | <div>ANTWOORD ALLEEN</div> <div>VOL PUNTE</div>                        | ✓ omskakeling<br>✓ $y = \left(\frac{1}{2}\right)^x$                                                        | (2)  |
| 5.2   |                                        | ✓ vorm<br>✓ $y$ – afsnit<br>✓ enige ander korrekte punt op die grafiek |                                                                                                            | (3)  |
| 5.3   | $\log_{\frac{1}{2}} x > -5$<br>$x < \left(\frac{1}{2}\right)^{-5}$<br>$x < 32$ ; maar $x > 0$<br>$\therefore 0 < x < 32$ | <div>ANTWOORD ALLEEN</div> <div>VOL PUNTE</div>                        | ✓ $x < \left(\frac{1}{2}\right)^{-5}$<br>✓ $x < 32$<br>aanvaar: Kritiese waarde $x = 32$<br>✓ $0 < x < 32$ | (3)  |
|       |                                                                                                                          |                                                                        |                                                                                                            | [10] |



| VRAAG 6 |                                                                                                                                                                                                          |                                                                                                 |     |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----|
| 6.1.1   | $y = -x + k$<br>$-1 = -(-4) + k$<br>$-1 = 4 + k$<br>$k = -5$                                                                                                                                             | ✓ substitusie<br>✓ $k = -5$                                                                     | (2) |
| 6.1.2   | $p = 4$<br>$q = -1$<br>$y = \frac{a}{x+4} - 1$<br>Gebruik A $(-8; 0)$<br>$0 = \frac{a}{-8+4} - 1$<br>$0 = \frac{a}{-4} - 1$<br>$1 = \frac{a}{-4}$<br>$\therefore a = -4$<br>$f(x) = -\frac{-4}{x+4} - 1$ | ✓ $p = 4$<br>✓ $q = -1$<br>✓ substitusie<br>✓ $a = -4$                                          | (4) |
| 6.2     | $-\frac{-4}{x+4} - 1 \geq -x - 5$<br>$\frac{-4}{x+4} \geq -x - 4$<br>$(x+4)^2 \geq 4$<br>Kritiese waardes:<br>$(x+4)^2 = 4$<br>$x+4 = \pm 2$<br>$x = -2$ en $x = -6$<br>$-6 \leq x < -4$ of $x \geq -2$  | ✓ ongelykheid<br>✓ vereenvoudiging<br>✓ kritiese waardes<br>✓ $-6 \leq x < -4$<br>✓ $x \geq -2$ | (5) |





|     |                                                                                                                                                                                                                                                                       |                                                                                                                                                  |      |
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| 6.3 | $\frac{-4}{x+4} - 1 = x + t$ $-4 - 1(x+4) = x(x+4) + t(x+4)$ $-4 - x - 4 = x^2 + 4x + tx + 4t$ $x^2 + (5+t)x + 8 + 4t = 0$ $b^2 - 4ac = 0$ $(5+t)^2 - 4(1)(8+4t) = 0$ $t^2 + 10t + 25 - 32 - 16t = 0$ $t^2 - 6t - 7 = 0$ $(t-7)(t+1) = 0$ $t = 7 \text{ oft } t = -1$ | ✓ stel gelyk<br>✓ $x^2 + (5+t)x + 8 + 4t = 0$<br>✓ substitusie in diskriminant<br>✓ $t^2 - 6t - 7 = 0$<br>✓ faktore/ Metode<br>✓ waardes van $t$ | (6)  |
|     |                                                                                                                                                                                                                                                                       |                                                                                                                                                  | [17] |



## VRAAG 7

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                 |     |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 7.1   | $f(x) = \frac{3}{x}$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{\left(\frac{3}{x+h}\right) - \left(\frac{3}{x}\right)}{h}$ $= \lim_{h \rightarrow 0} \frac{\left(\frac{3x - 3(x+h)}{x(x+h)}\right)}{h}$ $= \lim_{h \rightarrow 0} \frac{\left(\frac{3x - 3x - 3h}{x(x+h)}\right)}{h}$ $= \lim_{h \rightarrow 0} \left[ \frac{-3h}{x(x+h)} \times \frac{1}{h} \right]$ $= \lim_{h \rightarrow 0} \left[ \frac{-3}{x(x+h)} \right]$ $= \frac{-3}{x^2}$ | <p>✓ <math>\left(\frac{3}{x+h}\right)</math></p> <p>✓ vereenvoudiging van teller</p> <p>✓ noemer <math>x(x+h)</math></p> <p>✓ <math>\frac{-3h}{x(x+h)} \times \frac{1}{h}</math></p> <p>✓ <math>\frac{-3}{x^2}</math></p> <p>ANTWOORD ALLEEN <math>\frac{0}{5}</math></p> <p>Penaliseer 1 punt vir notasie<br/>SLEGS in 7.1</p> | (5) |
| 7.2.1 | $D_x \left[ \frac{\sqrt[3]{x^2} - x^{-\frac{3}{2}}}{\sqrt{x}} \right]$ $D_x \left[ \frac{x^{\frac{2}{3}} - x^{-\frac{3}{2}}}{x^{\frac{1}{2}}} \right]$ $D_x \left[ x^{-\frac{1}{2}} \left( x^{\frac{2}{3}} - x^{-\frac{3}{2}} \right) \right]$ $D_x \left[ x^{\frac{1}{6}} - x^{-2} \right]$ $\frac{1}{6} x^{-\frac{5}{6}} + 2 x^{-3}$                                                                                                                                                             | <p>✓ skakel beide wortels om na eksponente .</p> <p>✓ <math>x^{\frac{1}{6}} - x^{-2}</math></p> <p>✓ <math>\frac{1}{6} x^{-\frac{5}{6}}</math></p> <p>✓ <math>2 x^{-3}</math></p>                                                                                                                                               | (4) |



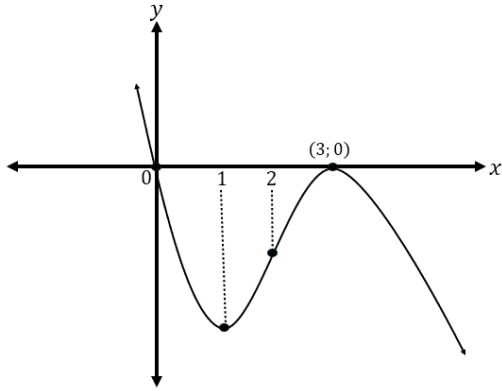
|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                 |     |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 7.2.2 | $\frac{dy}{dx}$ as $xy - y = x^2 - 1$<br><br>$y = \frac{(x^2 - 1)}{(x - 1)}$<br><br>$y = \frac{(x - 1)(x + 1)}{(x - 1)}$<br><br>$y = x + 1$<br><br>$\therefore \frac{dy}{dx} = 1$                                                                                                                                                                                                                                                                   | $\checkmark y = \frac{(x^2 - 1)}{(x - 1)}$<br><br>$\checkmark y = x + 1$<br><br>$\checkmark 1$                                                                                  | (3) |
| 7.3.1 | $f(x) = ax^3 + bx^2$<br>Die gradiënt van die raaklyn by $x = 1$ is 12.<br>$f'(x) = 3ax^2 + 2bx$<br>$f'(1) = 3a(1)^2 + 2b(1)$<br>$12 = 3a + 2b$<br>Gebruik punt (1; 5)<br>$5 = a(1)^2 + b(1)$<br>$5 = a + b$<br><i>los gelyktydig op</i><br>$b = 6 - \frac{3a}{2} \dots\dots\dots (1)$<br>$b = 5 - a \dots\dots\dots (2)$<br>$6 - \frac{3a}{2} = 5 - a$<br>$10 - 2a = 12 - 3a$<br>$3a - 2a = 2$<br>$\therefore a = 2$<br>$\Rightarrow b = 5 - 2 = 3$ | $\checkmark f'(x) = 3ax^2 + 2bx$<br>$\checkmark 3a + 2b = 12$<br>$\checkmark a + b = 5$<br>$\checkmark$ Vereenvoudiging tot $a = 2$<br>$\checkmark$ Vereenvoudiging tot $b = 3$ | (5) |





|       |                                                                                                                                                                                                                                                 |                                                                              |      |
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| 7.3.2 | $f(x) = 2x^3 + 3x^2$<br>$f'(x) = 6x^2 + 6x$<br>$6x^2 + 6x = 0$<br>$x^2 + x = 0$<br>$x(x + 1) = 0$<br>$\therefore x = 0$ of $x = -1$<br>$f(0) = 2(0)^3 + 3(0)^2 = 0$<br>$f(-1) = 2(-1)^3 + 3(-1)^2 = 1$<br>Die koördinate is $(0,0)$ en $(-1,1)$ | ✓ $f'(x)$<br>✓ stel gelyk aan 0<br>✓ $x$ -waardes<br>✓ $(0,0)$<br>✓ $(-1,1)$ | (5)  |
|       |                                                                                                                                                                                                                                                 |                                                                              | [22] |

**VRAAG 8**

|       |                                                                                         |                                                             |                |
|-------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------|
| 8.1.1 | Die grafiek het 'n lokale maksimum by $x = 3$<br><b>OF</b><br>Die grafiek is konkaf af. | ✓ ✓ lokale maksimum<br><b>of</b><br>✓ ✓ konkaf af           | (2)<br><br>(2) |
| 8.1.2 |      | ✓ afsnitte<br>✓ draaipunt<br>✓ punt van Infleksie<br>✓ vorm | (4)            |





|       |                                                                                                                                                                                                                                                                                                                                                               |                                                                                          |     |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-----|
| 8.1.3 | $x < 0$<br>$1 < x < 3$                                                                                                                                                                                                                                                                                                                                        | $\checkmark x < 0$<br>$\checkmark\checkmark 1 < x < 3$                                   | (3) |
| 8.2   | $f(x) = a(x)(x - 3)^2$<br>$-40 = a(5)(5 - 3)^2$<br>$-40 = 20a$<br>$\therefore a = -2$<br>$f(x) = -2(x)(x - 3)^2$<br>$f(x) = -2x(x^2 - 6x + 9)$<br>$f(x) = -2x^3 + 12x^2 - 18x$<br><b>OF</b><br>$f(x) = px^3 + qx + rx$<br>$f'(x) = 3px^2 + 2qx + r$<br>By die draaipunt;<br>$f'(x) = 0$<br>$3px^2 + 2qx + r = 0$<br>$x^2 + \frac{2q}{3p}x + \frac{r}{3p} = 0$ | $\checkmark$ subt van (5; -40)<br>$\checkmark -2$<br>$\checkmark 12$<br>$\checkmark -18$ |     |









|  |                                                                                                                                                                                                |  |      |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|
|  | $q = 8 - 2p$<br>$22p + 3(8 - 2p) = -8$<br>$22p + 24 - 6p = -8$<br>$16p = -32$<br>$p = -2$<br>$q = 8 - 2(-2) = 12$<br>$3p + 2q + r = 0$<br>$3(-2) + 2(12) + r = 0$<br>$18 + r = 0$<br>$r = -18$ |  | (4)  |
|  |                                                                                                                                                                                                |  | [13] |

## VRAAG 9

|      |                                                                                                                                                                                                                                                                                                                                     |                                                                                                             |      |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------|
| 9.1. | $V = lbh$<br>$2\,160\,000 = x^2 h$<br>$\therefore h = \frac{2\,160\,000}{x^2}$                                                                                                                                                                                                                                                      | ✓ substitusie<br>✓ $\frac{2\,160\,000}{x^2}$                                                                | (2)  |
| 9.2  | $Buite\ opp = 3x^2 + x^2 + 4xh$<br>$= 4x^2 + 4x\left(\frac{2\,160\,000}{x^2}\right)$<br>$A(x) = 4x^2 + \frac{8\,640\,000}{x}$                                                                                                                                                                                                       | ✓ $4x^2$<br>✓ $4xh$<br>✓ Subt van h                                                                         | (3)  |
| 9.3  | $A(x) = 4x^2 + 8\,640\,000x^{-1}$<br>$A'(x) = 8x - 8\,640\,000x^{-2}$<br>$= 8x - \frac{8\,640\,000}{x^2}$<br>$A'(x) = 0$<br>$8x - \frac{8\,640\,000}{x^2} = 0$<br>$8x^3 = 8\,640\,000$<br>$x^3 = 1\,080\,000$<br>$x = \sqrt[3]{1\,080\,000} = 102,6\text{ cm}$<br>$\therefore h = \frac{2\,160\,000}{(102,6)^2} = 205,19\text{ cm}$ | ✓ $8x - 8\,640\,000x^{-2}$<br>✓ stel $A'(x)$ gelyk aan 0.<br>✓ vereenvoudiging<br>✓ 102,6 cm<br>✓ 205,19 cm | (5)  |
|      |                                                                                                                                                                                                                                                                                                                                     |                                                                                                             | [10] |

