

FUNKSIES EN GRAFIEKE

Oplossings

Die DBE se eie nasienriglyne, in boekvolgorde

Elke oplossing hier is 'n uitknipsel van die amptelike DBE-nasienriglyn wat saam met die vraestel gepubliseer is waaruit die vraag kom. Die bewerking, die punt-merke en die aanvaarde alternatiewe is die DBE se eie. Niks is oorgeskryf of oor afgelei nie.

Die nommers pas by die vraeboek: oplossing 34 antwoord vraag 34, en die hoofstukke is in dieselfde volgorde.

Die DBE skryf een riglyn vir albei tale, so hierdie bladsye is tweetalig en hul nasienaantekeninge is grootliks in Engels. Dit is die DBE se eie bladsy, presies soos gedruk weergegee.

'n Nasienriglyn word vir nasieners geskryf, nie vir leerders nie. Dit wys die kortste pad na die punte, so waar 'n stap saamgepers lyk, is dit die riglyn wat bondig is eerder as 'n stap wat ontbreek.

1. Die inverse van 3 tot die x, en waar 'n verskuifde punt land

Amptelike DBE-nasienriglyn · Mei/Junie 2021 · V6 · 8 punte

QUESTION/VRAAG 6

6.1.1	$y = 3^x$ $x = 3^y$ $y = \log_3 x$	✓ swop x and y ✓ equation (2)
6.1.2	$h(x) = 3^{x-4} + 2$ Transformation: 4 units left, 2 units down $P'(2;9)$	✓ $x = 2$ (A) ✓ $y = 9$ (A) (2)
6.2	$f(x) = 2^{x+p} + q$ $q = -16$ $16 = 2^{p+3} - 16$ $2^{p+3} = 32$ $2^{p+3} = 2^5$ $\therefore p + 3 = 5$ $p = 2$	✓ $q = -16$ ✓ substitute (3 ; 16) ✓ $2^{p+3} = 2^5$ or $p + 3 = \log_2 32$ ✓ $p = 2$ (4)
		[8]

2. Log basis 4: vind k, skryf dan die inverse neer

Amptelike DBE-nasienriglyn · November 2021 · V6 · 8 punte

QUESTION/VRAAG 6

6.1	$f(x) = \log_4 x$ $2 = \log_4 k$ $4^2 = k$ $\therefore k = 16$	✓ substitution of $(k; 2)$ ✓ answer (2)
6.2	$-1 = \log_4 x \quad \therefore x = \frac{1}{4}$ $\frac{1}{4} \leq x \leq 16 \quad \text{or/of} \quad x \in \left[\frac{1}{4}; 16 \right]$	✓ $x = \frac{1}{4}$ ✓ answer (2)
6.3	$f(x) = \log_4 x$ $y = \log_4 x$ $x = \log_4 y$ $y = 4^x$	✓ swopping x and y ✓ answer (2)
6.4	$x < 0$ OR/OF $x \in (-\infty; 0)$	✓✓ answer (2) OR/OF ✓✓ answer (2)
		[8]

3. Vind a, beskryf dan die translasie van g na h

Amptelike DBE-nasienriglyn · Mei/Junie 2022 · V4 · 9 punte

QUESTION 4

4.1	$10 = a\left(\frac{1}{3}\right)^{-2} + 7$ $3 = 9a$ $\therefore a = \frac{1}{3}$	✓ subs (-2 ; 10) ✓ simplification ✓ answer (3)
4.2	$y = g(0)$ $y = \frac{1}{3} \times \left(\frac{1}{3}\right)^0 + 7$ $y = \frac{22}{3} = 7,33$ $\therefore \left(0 ; \frac{22}{3}\right)$ ANSWER ONLY: FULL MARKS	✓ substitution of $x = 0$ ✓ answer (2)
4.3.1	Translation by 1 unit to the right and 7 units downwards	✓ 1 unit right ✓ 7 units downwards (2)
4.3.2	$h(x) = \left(\frac{1}{3}\right)^x$ $h^{-1}: x = \left(\frac{1}{3}\right)^y$ $y = \log_{\frac{1}{3}}(x) \quad \text{OR/OR} \quad y = -\log_3(x)$ ANSWER ONLY: FULL MARKS	✓ swap x and y ✓ answer (2)
		[9]

4. 'n Logaritme en sy weerkaatsing in die lyn $y = x$

Amptelike DBE-nasienriglyn · Mei/Junie 2024 · V5 · 9 punte

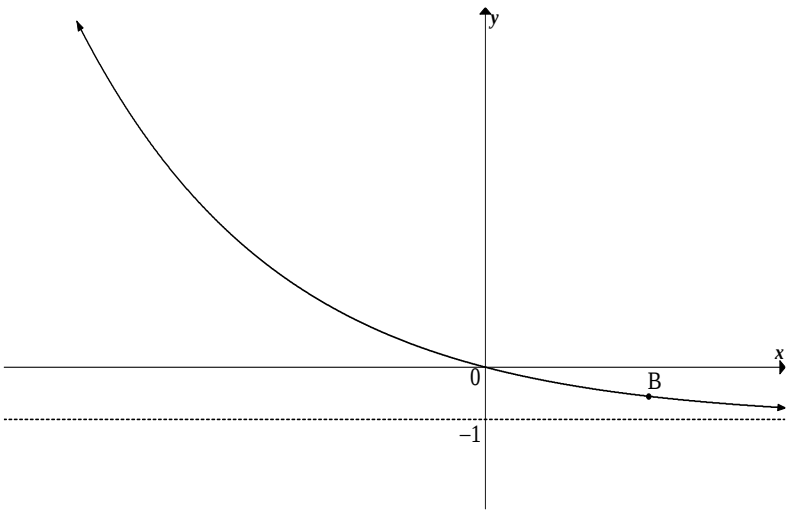
QUESTION5/VRAAG 5

5.1	$P'(2;4)$	$\checkmark x = 2$ $\checkmark y = 4$ (2)
5.2	$f(x) = \log_a x$ $2 = \log_a 4$ $a^2 = 4$ $a = 2$	$\checkmark$ substitute (4 ; 2) $\checkmark a^2 = 4$ (2)
5.3	$y = 2^x$	$\checkmark y = 2^x$ (1)
5.4	$1 = \log_2 x$ $\therefore x = 2$ T(2 ; 1) RT = 2 units P/T = 3 units Area of $\Delta RTP = \frac{1}{2} \cdot RT \cdot TP$ $= \frac{1}{2} \times 2 \times 3 = 3 \text{ units}^2$	$\checkmark x = 2$ $\checkmark RT = 2 \text{ units}$ $\checkmark P/T = 3 \text{ units}$ $\checkmark$ answer (4)
		[9]

5. 'n Eksponensiële grafiek een af geskuif, en die waardeversameling wat dit gee

Amptelike DBE-nasienriglyn · November 2024 · V4 · 9 punte

QUESTION/VRAAG 4

4.1	$f(x) = a^x - 1$ $-\frac{5}{9} = a^2 - 1$ $a^2 = \frac{4}{9}$ $a = \frac{2}{3}$	✓ substitution ✓ answer (2)
4.2	$y > -1$ OR/OF $y \in (-1; \infty)$	✓ answer (1) ✓ answer (1)
4.3		✓(0 ; 0) ✓ asymptote ✓decreasing shape (3)
4.4	$\frac{19}{8} = \left(\frac{2}{3}\right)^x - 1$ $\frac{27}{8} = \left(\frac{2}{3}\right)^x$ $\left(\frac{3}{2}\right)^3 = \left(\frac{3}{2}\right)^{-x}$ $\therefore x = -3$ $\therefore C\left(-3; \frac{19}{8}\right)$ $C'\left(\frac{19}{8}; -3\right)$	✓substitution ✓ answer ✓ answer (3)
		[9]

6. 'n Eksponensiële grafiek en 'n reguit lyn wat by (3 ; 4) ontmoet

Amptelike DBE-nasienriglyn · Mei/Junie 2025 · V6 · 11 punte

QUESTION/VRAAG 6

6.1	$(0 ; -3) \quad -3 = p^0 + q \quad \text{OR} \quad y = p^x - 4$ $q = -4$ $(3 ; 4) \quad 4 = p^3 - 4$ $p^3 = 8$ $p = 2$ $\therefore f(x) = 2^x - 4$	✓ substitute (0 ; -3) ✓ answer for q ✓ substitute (3 ; 4) ✓ answer for p (4)
6.2	$y > -4 \quad \text{OR/OF} \quad y \in (-4 ; \infty)$	✓ answer (1)
6.3	$g(x) = mx + c$ $E(-3 ; 0)$ $m = \frac{4 - 0}{3 - (-3)} = \frac{2}{3}$ $y = \frac{2}{3}x + c$ $0 = \frac{2}{3}(-3) + c \quad \text{OR} \quad y - 0 = \frac{2}{3}(x + 3)$ $\therefore c = 2$ $y = \frac{2}{3}x + 2 \quad y = \frac{2}{3}x + 2$ OR/OF For g^{-1} : $y = mx - 3$ $3 = m(4) - 3$ $m = \frac{3}{2}$ $\therefore g^{-1}(x) = \frac{3}{2}x - 3$ For g : $2x + 6 = 3y$ $\frac{2}{3}x + 2 = y$ $\therefore y = \frac{2}{3}x + 2$	✓ $E(-3 ; 0)$ ✓ m_{AE} ✓ substitution ✓ equation (4) OR/OF ✓ substitution of (4 ; 3) ✓ m of inverse ✓ equation of g^{-1} ✓ equation of g (4)
6.4	$g(x) = \frac{2}{3}x + 2$ $x = \frac{2}{3}y + 2$ $g^{-1}(x) = \frac{3}{2}x - 3$	✓ swop x and y ✓ equation (2)
		[11]

7. 'n Reguit lyn en sy inverse, en waar die twee kruis

Amptelike DBE-nasienriglyn · November 2022 · V5 · 13 punte

QUESTION 5/VRAAG 5

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

5.5	$BC = \sqrt{6^2 + 6^2} = \sqrt{72} = 6\sqrt{2}$ $AB = AC = \sqrt{180}$ symmetry of g and g^{-1} $\perp h = (\sqrt{180})^2 - \left(\frac{\sqrt{72}}{2}\right)^2$ $= \sqrt{162} = 9\sqrt{2}$ area of $\triangle ABC = \frac{1}{2} BC \times h$ $= \frac{1}{2} \times \sqrt{72} \times \sqrt{162} = 54 \text{ units}^2$ OR/OF $\tan \hat{BDC} = 2$ $\therefore \hat{BDC} = 63,43^\circ$ $\tan \hat{DCA} = \frac{1}{2}$ $\therefore \hat{DCA} = 26,57^\circ$ $\therefore \hat{DAC} = 36,86^\circ$ (ext angle triangle) Area of $\triangle ABC = \frac{1}{2} (\sqrt{180}) (\sqrt{180}) \sin 36,86^\circ$ $= 53,99 \text{ units}^2$ OR/OF Area of $\triangle ABC = \text{Area of } \triangle BDC + \text{Area of } \triangle ADC$ $= \frac{1}{2} DC \cdot BO + \frac{1}{2} DC \cdot \text{height}$ $= \frac{1}{2} (9)(6) + \frac{1}{2} (9)(6)$ $= 54 \text{ units}^2$	✓ BC ✓ AB = AC /midpoint (3 ; 3) ✓ $\perp h$ (A) ✓ substitution ✓ answer (A) (5) OR/OF ✓ $\hat{BDC} = 63,43^\circ$ ✓ $\hat{DAC} = 36,86^\circ$ ✓ $AC = \sqrt{180}$ ✓ substitution into the correct formula ✓ answer (A) (5) OR/OF ✓ Areas ($\triangle BDC + \triangle ADC$) ✓ $\frac{1}{2} DC \cdot BO$ ✓ $\frac{1}{2} DC \cdot \text{height}$ ✓ substitution ✓ answer (A) (5)
		[13]

8. 2 tot die x min 4, op 'n geslote interval

Amptelike DBE-nasienriglyn · November 2023 · V4 · 14 punte

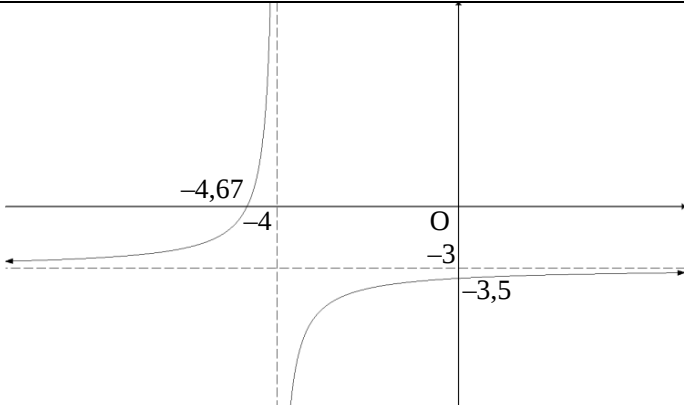
QUESTION 4/VRAAG 4

4.1	$y = -4$	✓ $y = -4$ (1)
4.2	x – intercept: $0 = 2^x - 4$ $4 = 2^x$ $x = 2$ $\therefore B(2;0)$	✓ $y = 0$ ✓ $x = 2$ (2)
4.3	$y = 2^0 - 4 = -3$ $\therefore A(0; -3)$ $y = mx + c$ $m = \frac{3}{2}$ $k(x) = \frac{3}{2}x - 3$	✓ $y = -3$ ✓ gradient ✓ equation (3)
4.4	$k(1) = \frac{3}{2}(1) - 3 = \frac{-3}{2}$ $f(1) = 2^1 - 4 = -2$ Vertical distance $= -\frac{3}{2} - (-2) = \frac{1}{2}$ units	✓ $k(1)$ ✓ $f(1) = -2$ ✓ answer (3)
4.5	$g(x) = f(x) + 4$ $g(x) = 2^x ; x \in [-2; 4)$	✓ $g(x) = 2^x$ (1)
4.6	Range of $g : y \in \left[\frac{1}{4}; 16\right)$ Domain of $g^{-1} : x \in \left[\frac{1}{4}; 16\right)$ or/of $\frac{1}{4} \leq x < 16$	 ✓ ✓ $x \in \left[\frac{1}{4}; 16\right)$ (2)
4.7	$g : y = 2^x$ $g^{-1} : x = 2^y$ $g^{-1}(x) = \log_2 x, x \in \left[\frac{1}{4}; 16\right)$	✓ swop x and y ✓ equation (2)
		[14]

9. Toon dat $p = 4$ en $q = -3$, skets dan die hiperbool

Amptelike DBE-nasienriglyn · Mei/Junie 2021 · V4 · 10 punte

QUESTION/VRAAG 4

4.1	$x+1=-x-7$ $2x=-8$ $x=-4$ $\therefore y=-3$ $\therefore f(x)=\frac{-2}{x+4}-3$ $\therefore p=4$ and $q=-3$ OR/OF $p+q=1$(1) $-p+q=-7$ $q=p-7$(2) subs. (2) into (1) $p+p-7=1$ $2p=8$ $p=4$ $q=-3$	$\checkmark x+1=-x-7$ $\checkmark 2x=-8$ $\checkmark x=-4$ $\checkmark y=-3$ OR/OF $\checkmark p+q=1$ $\checkmark q=p-7$ $\checkmark$ substitution $\checkmark$ simplification (4)
4.2	$y=\frac{-2}{x+4}-3$ $0=\frac{-2}{x+4}-3$ $-2-3(x+4)=0$ $-3x-14=0$ $\therefore x=-\frac{14}{3}$	$\checkmark y=0$ $\checkmark x=-\frac{14}{3}$ (2)
4.3		$\checkmark$ horizontal asymptote $\checkmark$ vertical asymptote $\checkmark$ y intercept $\checkmark$ shape (4)
		[10]

10. Asimptote, definisieversameling, en albei afsnitte

Amptelike DBE-nasienriglyn · November 2021 · V5 · 10 punte

QUESTION/VRAAG 5

5.1	$x = 3$ $y = 2$	$\checkmark x = 3$ $\checkmark y = 2$ (2)
5.2	$x \in \mathbb{R}, x \neq 3$ OR/OF $x \in (-\infty ; 3) \cup (3 ; \infty)$ OR/OF $x < 3$ or $x > 3$	$\checkmark$ answer (1) OR/OF $\checkmark$ answer (1) OR/OF $\checkmark$ answer (1)
5.3	$0 = \frac{-1}{x-3} + 2$ $-2x + 6 = -1$ $x = \frac{7}{2}$ x-int: $\left(\frac{7}{2} ; 0\right)$	$\checkmark y = 0$ $\checkmark$ answer (2)
5.4	y-int: $\left(0 ; \frac{7}{3}\right)$	$\checkmark x = 0$ $\checkmark \frac{7}{3}$ (2)
5.5		$\checkmark$ asymptotes $\checkmark$ intercepts with the axes $\checkmark$ shape (3)
		[10]

11. Asimptote, 'n skets, en waar die grafiek positief is

Amtelike DBE-nasienriglyn · Mei/Junie 2024 · V4 · 10 punte

QUESTION 4/VRAAG 4

4.1	$x = 1$ $y = 2$	✓ $x = 1$ ✓ $y = 2$ (2)
4.2		✓ x-intercept ✓ y-intercept ✓ asymptotes ✓ shape (4)
4.3	$x < \frac{1}{2}$ or $x > 1$	✓ $x < \frac{1}{2}$ ✓ $x > 1$ (2)
4.4	$y = -(x-1) + 2$ $y = -x + 3$ OR/OF $y - 2 = -(x-1)$ $y = -x + 3$ OR/OF $y = -x + c$ $2 = -(1) + c$ $c = 3$ $\therefore y = -x + 3$	✓ substitution of (1 ; 2) ✓ answer (2) OR/OF ✓ substitution of (1 ; 2) ✓ answer (2) OR/OF ✓ substitution of (1 ; 2) ✓ answer (2)
		[10]

12. 'n Simmetrie-as word gegee - vind p en q daaruit

Amptelike DBE-nasienriglyn · November 2024 · V5 · 10 punte

QUESTION/VRAAG 5

5.1	$p = -1$	✓ $p = -1$ (1)
5.2	$y = x - 3$ $y = 1 - 3$ $y = -2$ Answer only: $\frac{2}{2}$	✓ substitution ✓ answer (2)
5.3	$1 = \frac{a}{0-1} - 2$ $3 = \frac{a}{-1}$ $a = -3$	✓ substitute (0 ; 1) ✓ answer (2)
5.4	$\frac{-3}{x-1} - 2 = 0$ $-3 = 2x - 2$ $2x = -1$ $\therefore x = -\frac{1}{2}$ $x \in \left[-\frac{1}{2}; 1\right)$ OR/OF $-\frac{1}{2} \leq x < 1$	✓ x-intercept ✓✓ answer (3)
5.5	f is reflected in the y-axis, then translated 2 units to the right OR/OF f is reflected in the x-axis, then translated 4 units down OR/OF f is reflected about the line $x = 1$ OR/OF f is reflected about the line $y = -2$	✓ reflection in y -axis ✓ translation 2 units right (2) OR/OF ✓ reflection in x -axis ✓ translation 4 units down (2) OR/OF ✓✓ reflection about line $x = 1$ (2) OR/OF ✓✓ reflection about line $y = -2$ (2)
		[10]

13. Bou die vergelyking terug uit sy definisieversameling en een afsnit

Amptelike DBE-nasienriglyn · Mei/Junie 2022 · V5 · 12 punte

QUESTION 5

5.1	$g(x) = \frac{a}{x+2} + q$ Subs (1 ; 0): $0 = \frac{a}{1+2} + q$ $0 = a + 3q$ Subs $\left(0 ; -\frac{1}{2}\right)$ $-\frac{1}{2} = \frac{a}{0+2} + q$ $-1 = a + 2q$ Solving simultaneously: $q = 1$ $a = -3$ $\therefore g(x) = \frac{-3}{x+2} + 1$	$\checkmark g(x) = \frac{a}{x+2} + q$ $\checkmark 0 = a + 3q$ $\checkmark -1 = a + 2q$ $\checkmark$ solving simultaneously $\checkmark q = 1$ $\checkmark a = -3$ (6)
5.2	$y \in \mathbb{R}; y \neq 1$ OR/OF $(-\infty; 1)$ or $(1; \infty)$ OR/OF $y < 1$ or $y > 1$	$\checkmark$ answer (1)
5.3	$y - 1 = 1(x + 2)$ OR/OF $1 = 1(-2) + c$ ANSWER ONLY: FULL MARKS $c = 3$ $y = x + 3$ $y = x + 3$	$\checkmark m = 1$ $\checkmark$ subs point $(-2; 1)$ $\checkmark$ answer (3)
5.4	$K'(-3; 4)$	$\checkmark$ x-value $\checkmark$ y-value (2)
		[12]

14. Waar die asimptote mekaar sny, en die punt op f naaste daaraan

Amptelike DBE-nasienriglyn · Mei/Junie 2025 · V4 · 15 punte

QUESTION/VRAAG 4

4.1	M(3 ; 4)	✓ $x = 3$ ✓ $y = 4$ (2)
4.2	$f(x) = \frac{4}{x-3} + 4$ $y = \frac{4}{0-3} + 4 = \frac{8}{3}$ $\therefore D\left(0; \frac{8}{3}\right)$	✓ $x = 0$ ✓ y -value (2)
4.3	M(3 ; 4) $y = x + t$ OR/OF $y = (x + p) + q$ $4 = 3 + t$ $y = x - 3 + 4$ $t = 1$ $y = x + 1$ $\therefore t = 1$	✓ substituting M ✓ value of t (2)
4.4	$\frac{4}{x-3} + 4 = 0$ $-4(x-3) = 4$ $x-3 = -1$ $x = 2$ C(2 ; 0) $\therefore 2 \leq x < 3$	✓ $y = 0$ ✓ $x = 2$ ✓✓ answer (4)
4.5	$\frac{4}{x-3} + 4 = x + 1$ $\frac{4}{x-3} = x - 3$ $4 = (x-3)^2$ $\pm 2 = x - 3$ $\therefore x = 5 \quad \text{or} \quad x \neq 1$ $\therefore A(5 ; 6)$ OR/OF Point closest to the origin in $y = \frac{a}{x}$ is $(\sqrt{a}; \sqrt{a})$ By translation: A($\sqrt{a} + 3$; $\sqrt{a} + 4$) A(5 ; 6)	✓ equating ✓ x_A ✓ y_A OR/OF ✓ translation ✓ x_A ✓ y_A (3)
4.6	$h(x) = \frac{-4}{x+3} + 4$ $= \frac{4}{-x-3} + 4$ $\therefore \text{Reflection in } y - \text{axis.}$ A'(-5; 6) AA' = 10	 ✓ coordinates ✓ distance (2)

15. Asimptote by (1 ; 2), en alles wat daaruit volg

Amptelike DBE-nasienriglyn · November 2022 · V4 · 20 punte

QUESTION 4/VRAAG 4

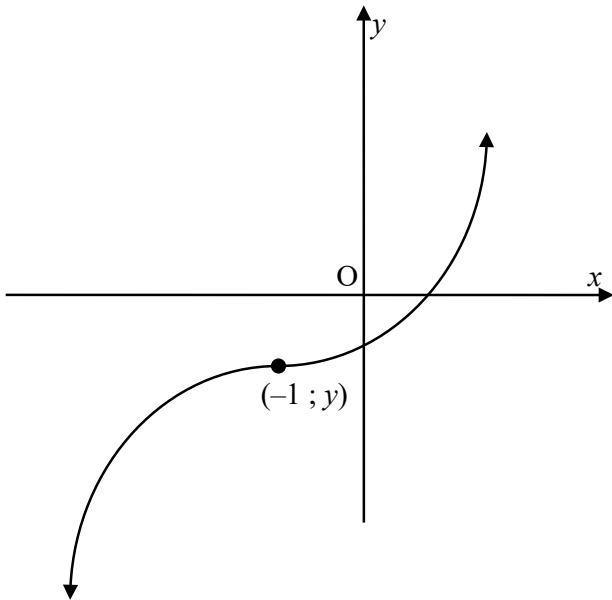
4.1.1	$p = -1$ and $q = 2$	✓ $p = -1$ ✓ $q = 2$ (2)
4.1.2	$\frac{1}{x-1} + 2 = 0$ $-2x + 2 = 1$ $x = \frac{1}{2}$ $\left(\frac{1}{2}; 0\right)$	✓ = 0 ✓ answer (2)
4.1.3	$x = \frac{1}{2} - 3$ $= \frac{-5}{2}$ Answer only: full marks	✓ -3 ✓ $x = \frac{-5}{2}$ (2)
4.1.4	$y = x + t$ $2 = 1 + t$ $t = 1$	✓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

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

16. Van 'n draaipunt en een ander punt na die vergelyking

Amptelike DBE-nasienriglyn · Mei/Junie 2025 · V5 · 9 punte

QUESTION/VRAAG 5

5.1	$y = a(x+1)^2 + 4$ $-4 = a(-3+1)^2 + 4$ $-8 = 4a$ $-2 = a$ $y = -2(x+1)^2 + 4$ $y = -2x^2 - 4x + 2$	$\checkmark$ substitute $(-1 ; 4)$ $\checkmark$ substitute $(-3 ; -4)$ $\checkmark -8 = 4a$ (3)
5.2	$k < -4$	$\checkmark \checkmark k < -4$ (2)
5.3		$\checkmark$ point of inflection $\checkmark$ change of concavity at $x = -1$ $\checkmark$ y-intercept below x-axis $\checkmark$ increasing curve (4)
		[9]

Amptelike DBE-nasienriglyn · Mei/Junie 2022 · V6 · 14 punte

6.1	$f(x) = -x^2 - 6x + 7$ $f'(x) = -2x - 6$ $-2x - 6 = 0$ OR/OF $x = -\frac{(-6)}{2(-1)}$ $x = -3$ E(-3 ; 16) ANSWER ONLY: FULL MARKS	✓ method ✓ x-value ✓ y-value (3)
6.2	$k = f(-5)$ $k = -(-5)^2 - 6(-5) + 7$ $\therefore k = 12$	✓ answer (A) (1)
6.3	C(0 ; 7) D(-5 ; 12) $m_{CD} = \frac{12 - 7}{-5 - 0}$ $m_{CD} = -1$ Equation of CD: $y = -x + 7$	✓ coordinates of C ✓ substitution ✓ m ✓ answer (4)
6.4	$-2x - 6 = -1$ $-2x = 5$ $x = -\frac{5}{2}$ $y = f\left(-\frac{5}{2}\right) = -\left(-\frac{5}{2}\right)^2 - 6\left(-\frac{5}{2}\right) + 7 = \frac{63}{4} = 15,75$ $\therefore P\left(-\frac{5}{2}; \frac{63}{4}\right)$	✓ $f'(x) = -2x - 6$ ✓ equating to -1 ✓ x-value ✓ y-value (A) (4)
6.5	Point by symmetry: (-1 ; 12) $-5 < x < -1$ OR/OF $-x^2 - 6x + 7 > 12$ $-x^2 - 6x - 5 > 0$ $x^2 + 6x + 5 < 0$ $(x+1)(x+5) < 0$ $-5 < x < -1$ ANSWER ONLY: FULL MARKS	✓ -1 ✓ answer (2) ✓ -1 ✓ answer (2)
		[14]

18. 'n Parabool en 'n lyn, en die gaping EH tussen hulle

Amptelike DBE-nasienriglyn · November 2024 · V6 · 15 punte

QUESTION / VRAAG 18

6.1	$x = \frac{-4}{2(-1)} = 2 \quad \text{OR/OF} \quad f'(x) = -2x + 4 = 0$ $x = 2$ $y = -(2)^2 + 4(2) + 5$ $= 9$ $\therefore B(2; 9)$	✓ method for x ✓ value of x ✓ value for y (3)
6.2	$x^2 - 4x - 5 = 0$ $(x - 5)(x + 1) = 0$ $x = 5 \quad \text{or} \quad x = -1$ $\therefore A(-1; 0)$ Equation of AC: $\frac{8-0}{3+1} = \frac{y-0}{x+1} \quad \text{OR/OF} \quad m = \frac{8-0}{3+1} = 2$ $8x + 8 = 4y \quad y - 0 = 2(x + 1)$ $2x + 2 = y \quad y = 2x + 2$	✓ $A(-1; 0)$ ✓ method for gradient ✓ substitute point A or C into equation of a straight line (3)
6.3	$EH = -x^2 + 4x + 5 - (2x + 2)$ $EH = -x^2 + 2x + 3$ Max EH at: $-2x + 2 = 0 \quad \text{OR/OF} \quad x = \frac{-b}{2a} = \frac{-(-2)}{2(-1)}$ $x = 1 \quad x = 1$ Max length of EH $= -(1)^2 + 2(1) + 3$ Answer only: $\frac{1}{4}$	✓ difference ✓ $EH = -x^2 + 2x + 3$ ✓ x - value ✓ length (4)
6.4	$k(x) = f(x + m)$ $= -x^2 - 2mx - m^2 + 4x + 4m + 5$ $k'(x) = -2x - 2m + 4$ $k'(x) = 2$ $-2x - 2m + 4 = 2$ $-2x = 2m - 2$ $x = 1 - m$ Answer only: $\frac{0}{5}$ $k(1 - m) = g(1 - m)$ $-(1 - m)^2 - 2m(1 - m) - m^2 + 4(1 - m) + 4m + 5 = 2(1 - m) + 2$ $-1 + 2m - m^2 - 2m + 2m^2 - m^2 + 4 - 4m + 4m + 5 = 2 - 2m + 2$ $-2m - 4 = 0$ $\therefore m = -2$	✓ $k'(x)$ ✓ $k'(x) = 2$ ✓ $x = 1 - m$ ✓ substitution ✓ answer

	OR/OF $k(x) = f(x+m) = g(x)$ $-x^2 - 2mx - m^2 + 4x + 4m + 5 = 2x + 2$ $0 = x^2 + (2m-2)x + m^2 - 4m - 3$ $\Delta = (2m-2)^2 - 4(1)(m^2 - 4m - 3)$ $\Delta = 4m^2 - 8m + 4 - 4m^2 + 16m + 12$ $\Delta = 8m + 16 = 0$ $\therefore m = -2$ OR/OF $f(x) = -x^2 + 4x + 5$ $f'(x) = -2x + 4 = 2$ $-2x = -2$ $x = 1$ $f(1) = -(1)^2 + 4(1) + 5$ $\therefore y = 8$ $\therefore \text{translate 2 units to the right}$ $\therefore m = -2$	OR/OF ✓ equating ✓ simplification ✓ substitution into Δ ✓ $\Delta = 0$ ✓ answer (5) OR/OF ✓ $f'(x) = 2$ ✓ x-value ✓ y-value ✓ 2 units to the right ✓ answer (5)
		[15]

19. 'n Parabool, en 'n lyn waarvan die hellingshoek gegee is

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QUESTION 7

7.1	B(-4 ; 0) D(6 ; 0)	✓ B(-4 ; 0) ✓ D(6 ; 0) (2)
7.2	$f(x) = x^2 - 2x - 24$ $x_{tp} = \frac{-b}{2a}$ OR/OF $2x - 2 = 0$ OR/OF $x = \frac{-4+6}{2}$ $x = \frac{-(-2)}{2(1)}$ $\therefore x_{tp} = 1$ $y_{tp} = f(1)$ $= 1^2 - 2(1) - 24$ $= -25$ C(1 ; -25)	✓ $x_{tp} = 1$ ✓ $y_{tp} = -25$ (2)
7.3	$y \geq -25$ OR/OF $y \in [-25 ; \infty)$	✓ answer (1) OR/OF ✓ answer (1)
7.4.1	$m_{AE} = \tan 14,04^\circ = 0,25 = \frac{1}{4}$	✓ answer (1)
7.4.2	$m_{\text{tang}} = -4$ $f'(x) = 2x - 2$ $2x - 2 = -4$ $x_T = -1$ $y_T = -21$	✓ $m_{\text{tang}} = -4$ ✓ $f'(x) = 2x - 2$ ✓ equating ✓ $x_T = -1$ ✓ $y_T = -21$ (5)
7.5	$m_{\text{line}} = \frac{1}{4}$ $y + 9 = \frac{1}{4}(x + 3)$ OR/OF $-9 = \frac{1}{4}(-3) + c$ $y + 9 = \frac{1}{4}x + \frac{3}{4}$ $c = -\frac{33}{4} = -8,25$ $y = \frac{1}{4}x - \frac{33}{4}$ OR/OF $y = 0,25x - 8,25$ $x^2 - 2x - 24 = \frac{1}{4}x - \frac{33}{4}$ $4x^2 - 8x - 96 = x - 33$ $4x^2 - 9x - 63 = 0$ $(4x - 21)(x + 3) = 0$ $\therefore x = \frac{21}{4} = 5,25$ or $x \neq -3$	✓ $m_{\text{line}} = \frac{1}{4}$ ✓ substitution m and $K(-3 ; -9)$ ✓ $y = \frac{1}{4}x - \frac{33}{4}$ ✓ equating ✓ standard form ✓ answer with selection (6)
		[17]

20. 'n Parabool wat 'n reguit lyn ontmoet, en die afstand tussen hulle

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QUESTION/VRAAG 5

5.1	$-2x^2 + 4x + 16 = 0$ $x^2 - 2x - 8 = 0$ $(x-4)(x+2) = 0$ $x = 4$ or $x = -2$ $\therefore A(-2;0)$ and $B(4;0)$	$\checkmark$ factors $\checkmark x = -2$ $\checkmark x = 4$ (3)
5.2	$f(x) = -2x^2 + 4x + 16$ $-\frac{b}{2a} = -\frac{-4}{-2(2)} = 1$ $f(1) = -2(1)^2 + 4(1) + 16 = 18$ $\therefore C(1;18)$ OR/OF $f(x) = -2x^2 + 4x + 16$ $f'(x) = -4x + 4$ $-4x + 4 = 0$ $x = 1$ $f(1) = -2(1)^2 + 4(1) + 16 = 18$ $\therefore C(1;18)$	$\checkmark 1$ $\checkmark 18$ OR/OF $\checkmark 1$ $\checkmark 18$ (2)
5.3	$y \leq 18$ OR/OF $y \in (-\infty; 18]$	$\checkmark y \leq 18$ (1) OR/OF $\checkmark y \in (-\infty; 18]$ (1)
5.4	TP (1 ; 18) for f TP (2 ; 15) for h $\therefore p = -1$ $q = -3$	$\checkmark$ TP for h at (2 ; 15) $\checkmark p = -1$ $\checkmark q = -3$ (3)
5.5	$y = 2x + 4$ $x = 2y + 4$ $\therefore y = \frac{1}{2}x - 2$	$\checkmark$ swop x and y $\checkmark y = \frac{1}{2}x - 2$ (2)
5.6	$g(x) = 0$ or $g^{-1}(x) = 0$ $x = 4$ or $x = -2$ (product 0 at x-intercepts)	$\checkmark x = 4$ $\checkmark x = -2$ (2)

5.7	$-2x^2 + 4x + 16 + k = 2x + 4$ $-2x^2 + 2x + 12 + k = 0$ $b^2 - 4ac < 0$ $(2)^2 - 4(-2)(12 + k) < 0$ $4 + 8(12 + k) < 0$ $100 + 8k < 0$ $k < -12,5$ OR/OF $g'(x) = 2$ $f'(x) = -4x + 4 = 2$ $x = \frac{1}{2}$ $f\left(\frac{1}{2}\right) = 17,5$ $g\left(\frac{1}{2}\right) = 5$ $\therefore k < -12,5$	✓equating ✓ standard form ✓ $b^2 - 4ac < 0$ ✓ substitution ✓ answer (5) OR/OF ✓ $g'(x) = 2$ ✓ $f'(x) = -4x + 4$ ✓ $f\left(\frac{1}{2}\right) = 17,5$ ✓ $g\left(\frac{1}{2}\right) = 5$ ✓ answer (5)
		[18]

21. 'n Draaipunt wat ook 'n snypunt is

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QUESTION 5/VRAAG 5

5.1	$(1; 8)$	$\checkmark x = 1 \checkmark y = 8$ (2)
5.2	$y = -\frac{1}{2}(0-1)^2 + 8$ $= 7\frac{1}{2}$ $C\left(0; \frac{15}{2}\right)$	$\checkmark x = 0$ $\checkmark$ answer (2)
5.3	$8 = \frac{d}{1}$ $\therefore d = 8$	$\checkmark$ substitution $(1; 8)$ (1)
5.4	$y \in R; y \neq 0$	$\checkmark y \neq 0$ (1)
5.5	$-3 \leq x < 0$ or $x \geq 5$ OR/OF $x \in [-3; 0) \cup [5; \infty)$	$\checkmark \checkmark -3 \leq x < 0$ $\checkmark x \geq 5$ (3)
5.6	$-2x + k = \frac{8}{x}$ $-2x^2 + kx - 8 = 0$ $\Delta = (k)^2 - 4(-2)(-8)$ $k^2 - 64 < 0$ $CV: k = 8; k = -8$ $\therefore -8 < k < 8$ or/of $k \in (-8; 8)$ OR/OF $g'(x) = h'(x)$ $-\frac{8}{x^2} = -2$ $-8 = -2x^2$ $x = \pm 2$ $y = \pm 4 \therefore B(2; 4) \text{ and } A(-2; -4)$ For tangents: $h(x) = -2x + k$ or $h(x) = -2x + k$ $4 = -2(2) + k$ $-4 = -2(-2) + k$ $k = 8$ $k = -8$ $\therefore -8 < k < 8$ or/of $k \in (-8; 8)$	$\checkmark -2x + k = \frac{8}{x}$ $\checkmark$ standard form $\checkmark$ substitution into Δ $\checkmark \Delta < 0$ or $\Delta = 0$ $\checkmark$ inequality (5) OR/OF $\checkmark -\frac{8}{x^2} \checkmark = -2$ $\checkmark$ x-values $\checkmark$ y-values $\checkmark$ inequality (5)

[illegible]

22. Waardeversameling, albei snypunte, en die lyn daardeur getrek

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QUESTION 6/VRAAG 6

6.1	$y \geq -4$ or $y \in [-4; \infty)$	✓ answer (1)
6.2	$x^2 - 2x - 3 = 0$ $(x - 3)(x + 1) = 0$ $x = 3$ or $x = -1$ $\therefore E(3; 0)$ and $D(-1; 0)$	✓ = 0 ✓ both x-values ✓ correct identification of coordinates (3)
6.3	$P(0; -3)$ $\therefore m_{PE} = 1$ $\therefore g(x) = x - 3$	✓ $m_{PE} = 1$ ✓ $g(x) = x - 3$ (2)
6.4	$f(x) > g(x)$ $x < 0$ or $x > 3$	✓ $x < 0$ ✓ $x > 3$ (2)
6.5	Distance $= -x^2 + 2x + 3 - x + 3 = -x^2 + x + 6$ $D' = -2x + 1 = 0$ or/of $x = -\frac{b}{2a}$ $\therefore x = \frac{1}{2}$ $\therefore x = \frac{1}{2}$ $D\left(\frac{1}{2}\right) = -\left(\frac{1}{2}\right)^2 + \frac{1}{2} + 6$ $= \frac{25}{4} = 6,25$	✓ $D = -x^2 + x + 6$ ✓ method ✓ $x = \frac{1}{2}$ ✓ substitution ✓ answer (5)
6.6	$f'(x) = m$ $1 = 2x - 2$ $x = \frac{3}{2}$ Point on $f: \left(\frac{3}{2}; -\frac{15}{4}\right)$ $-\frac{15}{4} = \left(\frac{3}{2} - 3\right) - n$ $\therefore n = 2\frac{1}{4} = \frac{9}{4} = 2,25$ OR/OF $f(x) = k(x)$ $x^2 - 2x - 3 = x - 3 - n$ $x^2 - 3x + n = 0$ $\Delta = b^2 - 4ac$ $= (-3)^2 - 4(1)(n)$ To touch: $\Delta = 0$ $0 = 9 - 4n$ $4n = 9$ $n = \frac{9}{4}$	✓ $1 = 2x - 2$ ✓ $x = \frac{3}{2}$ ✓ $-\frac{15}{4}$ ✓ $-\frac{15}{4} = \left(\frac{3}{2} - 3\right) - n$ ✓ answer (5) OR/OF ✓ equating ✓ standard form ✓ substitution into Δ ✓ $\Delta = 0$ ✓ answer (5)
		[18]