

ALGEBRA EN VERGELYKINGS

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.

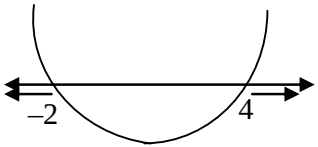
Die DBE skryf een riglyn vir albei tale, so hierdie bladsye is tweetalig en hul nasienaantekeninge is grootliks in Engels. Dit is die DBE se eie bladsy, presies soos gedruk weergegee.

'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. Vier vergelykings, 'n gelyktydige paar, dan 2^x maal $3^y = 24$

Amptelike DBE-nasienriglyn · Mei/Junie 2021 · V1 · 24 punte

QUESTION/VRAAG 1

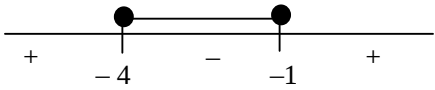
1.1.1	$x^2 - x - 20 = 0$ $(x-5)(x+4) = 0$ $x = 5$ or $x = -4$	✓ factors ✓ $x = 5$ ✓ $x = -4$ (3)
1.1.2	$3x^2 - 2x - 6 = 0$ $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-6)}}{2(3)}$ $x = \frac{1 \pm \sqrt{19}}{3}$ $x = -1,12$ or $x = 1,79$	✓ substitution ✓ simplification ✓ $x = -1,12$ ✓ $x = 1,79$ (4)
1.1.3	$(x-1)^2 > 9$ $x^2 - 2x - 8 > 0$ $(x-4)(x+2) > 0$ Critical values: $x = 4$ or $x = -2$  $x < -2$ or $x > 4$ OR/OF $(-\infty; -2)$ or $(4; \infty)$ OR/OF $x - 1 > 3$ or $x - 1 < -3$ $x > 4$ or $x < -2$	✓ standard form ✓ critical values ✓✓ $x < -2$ or $x > 4$ (4) OR/OF ✓✓ $(-\infty; -2)$ or $(4; \infty)$ OR/OF ✓ $x - 1 > 3$ ✓ $x - 1 < -3$ ✓✓ $x > 4$ or $x < -2$ (4)

1.1.4	$2\sqrt{x+6} + 2 = x$ $2\sqrt{x+6} = x - 2$ $4(x+6) = (x-2)^2$ $4x + 24 = x^2 - 4x + 4$ $x^2 - 8x - 20 = 0$ $(x-10)(x+2) = 0$ $x = 10 \quad \text{or} \quad x = -2$	$\checkmark$ isolating the surd $\checkmark 4x + 24 = x^2 - 4x + 4$ $\checkmark x = 10$ $\checkmark x = -2$ (4)
1.2	$4x = 2 - y \quad . . . (1)$ $4x + y^2 = 8 \quad . . . (2)$ $\therefore 2 - y + y^2 = 8$ $y^2 - y - 6 = 0$ $(y-3)(y+2) = 0$ $y = 3 \quad \text{or} \quad y = -2$ $x = -\frac{1}{4} \quad \text{or} \quad x = 1$ OR/OF $y = -4x + 2 \quad . . . (1)$ $4x + y^2 = 8 \quad . . . (2)$ $4x + (-4x + 2)^2 = 8$ $4x + 16x^2 - 16x + 4 - 8 = 0$ $16x^2 - 12x - 4 = 0$ $4x^2 - 3x - 1 = 0$ $(4x+1)(x-1) = 0$ $x = -\frac{1}{4} \quad \text{or} \quad x = 1$ $y = 3 \quad \text{or} \quad y = -2$	$\checkmark 4x = 2 - y$ $\checkmark$ substitution $\checkmark$ standard form $\checkmark$ y-values $\checkmark$ x-values OR/OF $\checkmark y = -4x + 2$ $\checkmark$ substitution $\checkmark$ standard form $\checkmark$ x-values $\checkmark$ y-values (5)
1.3	$2^x \times 3^y = (2^3 \times 3)^6$ $2^x \times 3^y = 2^{18} \times 3^6$ $2^x = 2^{18} \quad \text{and} \quad 3^y = 3^6$ $x = 18 \quad \text{and} \quad y = 6$ $\therefore x - y = 18 - 6$ $\therefore x - y = 12$	$\checkmark 2^3 \times 3$ $\checkmark 2^{18} \text{ or } 3^6$ $\checkmark x = 18 \text{ or } y = 6$ $\checkmark$ answer (A) (4)

2. 'n Gelyktydige paar, dan bewys dat 'n wortel nie reëel kan wees nie

Amptelike DBE-nasienriglyn · November 2021 · V1 · 24 punte

QUESTION/VRAAG 1

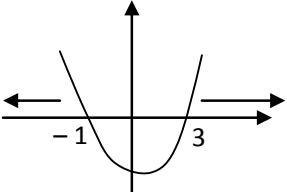
1.1.1	$x^2 - 2x - 24 = 0$ $(x-6)(x+4) = 0$ $x = 6$ or $x = -4$	✓ factors ✓ $x = 6$ ✓ $x = -4$ (3)
1.1.2	$2x^2 - 3x - 3 = 0$ $x = \frac{3 \pm \sqrt{(-3)^2 - 4(2)(-3)}}{2(2)}$ $x = \frac{3 \pm \sqrt{33}}{4}$ $x = 2,19$ or $x = -0,69$	✓ substitution into the correct formula ✓ $x = 2,19$ ✓ $x = -0,69$ (3)
1.1.3	$x^2 + 5x \leq -4$ $x^2 + 5x + 4 \leq 0$ $(x+4)(x+1) \leq 0$ Critical values: $x = -4$ or $x = -1$  $-4 \leq x \leq -1$ OR/OF $x \in [-4; -1]$	✓ standard form ✓ critical values ✓✓ answer (4)
1.1.4	$\sqrt{x+28} = 2-x$ $(\sqrt{x+28})^2 = (2-x)^2$ $x+28 = 4-4x+x^2$ $x^2 - 5x - 24 = 0$ $(x-8)(x+3) = 0$ $x \neq 8$ or $x = -3$	✓ squaring both sides ✓ standard form ✓ factors ✓ answers with selection (4)

1.2	$2y = 3 + x$ $x = 2y - 3 \quad \dots (1)$ $2xy + 7 = x^2 + 4y^2 \quad \dots (2)$ $2y(2y - 3) + 7 = (2y - 3)^2 + 4y^2$ $4y^2 - 6y + 7 = 4y^2 - 12y + 9 + 4y^2$ $4y^2 - 6y + 2 = 0$ $2y^2 - 3y + 1 = 0$ $(2y - 1)(y - 1) = 0$ $y = \frac{1}{2} \text{ or } y = 1$ $x = -2 \text{ or } x = -1$ OR/OF $2y = 3 + x$ $y = \frac{3}{2} + \frac{x}{2} \quad \dots (1)$ $2xy + 7 = x^2 + 4y^2 \quad \dots (2)$ $2x\left(\frac{3}{2} + \frac{x}{2}\right) + 7 = x^2 + 4\left(\frac{3}{2} + \frac{x}{2}\right)^2$ $3x + x^2 + 7 = x^2 + 9 + 6x + x^2$ $x^2 + 3x + 2 = 0$ $(x + 2)(x + 1) = 0$ $x = -2 \text{ or } x = -1$ $y = \frac{1}{2} \text{ or } y = 1$	$\checkmark$ equation 1 $\checkmark$ substitution $\checkmark$ simplification $\checkmark$ standard form $\checkmark$ y – values $\checkmark$ x – values OR/OF $\checkmark$ equation 1 $\checkmark$ substitution $\checkmark$ simplification $\checkmark$ standard form $\checkmark$ x – values $\checkmark$ y – values (6)
1.3	$\frac{n}{m} = \frac{p}{n}$ $n^2 = mp$ $\Delta = b^2 - 4ac$ $\Delta = n^2 - 4mp$, but $n^2 = mp$ $\Delta = n^2 - 4n^2 \quad \text{OR/OF} \quad \Delta = mp - 4mp$ $\Delta = -3n^2 \quad \Delta = -3mp$ $n^2 > 0 \quad mp > 0$ $\therefore -3n^2 < 0 \quad \therefore -3mp < 0$ $\therefore \Delta < 0 \Rightarrow x$ is a non-real number	$\checkmark \frac{n}{m} = \frac{p}{n}$ $\checkmark n^2 = mp$ $\checkmark \Delta = -3n^2 \text{ or } -3mp$ $\checkmark \Delta < 0$ (4)
		[24]

3. Omgekeerdes in 'n gelyktydige paar, dan m + n uit magte van 2 en 3

Amptelike DBE-nasienriglyn · November 2023 · V1 · 24 punte

QUESTION 1/VRAAG 1

1.1.1	$x^2 + x - 12 = 0$ $(x - 3)(x + 4) = 0$ $x = 3$ or $x = -4$	✓ factors/formula ✓ answer ✓ answer (3)
1.1.2	$3x^2 - 2x = 6$ $3x^2 - 2x - 6 = 0$ $x = \frac{2 \pm \sqrt{(-2)^2 - 4(3)(-6)}}{2(3)}$ $x = 1,79$ or $x = -1,12$	✓ standard form ✓ substitution into correct formula ✓ answer ✓ answer (4)
1.1.3	$\sqrt{2x+1} = x-1$ $2x+1 = (x-1)^2$ $2x+1 = x^2 - 2x + 1$ $x^2 - 4x = 0$ $x(x-4) = 0$ $x = 0$ or $x = 4$ $x \neq 0$ or $x = 4$	✓ squaring both sides ✓ standard form ✓ both x-values ✓ valid answer (4)
1.1.4	$x^2 - 2x > 3$ $x^2 - 2x - 3 > 0$ $(x-3)(x+1) > 0$ CV's: $x = -1$; $x = 3$  $x < -1$ or $x > 3$	✓ standard form ✓ critical values/factors ✓✓ answer (4)

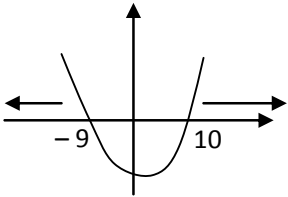
1.2	$\frac{1}{x} + \frac{1}{y} = 1 \quad \dots \quad (1)$ $x + 2 = 2y \quad \dots \quad (2)$ $x = 2y - 2$ $\frac{1}{2y - 2} + \frac{1}{y} = 1$ $y + 2y - 2 = 2y^2 - 2y$ $2y^2 - 5y + 2 = 0$ $(2y - 1)(y - 2) = 0$ $y = \frac{1}{2} \quad \text{or} \quad y = 2$ $x = -1 \quad \text{or} \quad x = 2$ OR/OF $\frac{1}{x} + \frac{1}{y} = 1 \quad \dots \quad (1)$ $x + 2 = 2y \quad \dots \quad (2)$ $y = \frac{x}{2} + 1$ $\frac{1}{x} + \frac{1}{\frac{x}{2} + 1} = 1$ $\frac{1}{x} + \frac{2}{x + 2} = 1$ $x + 2 + 2x = x^2 + 2x$ $x^2 - x - 2 = 0$ $(x + 1)(x - 2) = 0$ $x = -1 \quad \text{or} \quad x = 2$ $y = \frac{1}{2} \quad \text{or} \quad y = 2$	$\checkmark x = 2y - 2$ $\checkmark \text{substitution}$ $\checkmark \text{standard form}$ $\checkmark y\text{-values}$ $\checkmark x\text{-values} \quad (5)$ OR/OF $\checkmark y = \frac{x}{2} + 1$ $\checkmark \text{substitution}$ $\checkmark \text{standard form}$ $\checkmark x\text{-values}$ $\checkmark y\text{-values} \quad (5)$
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1.3	$2^{m+1} + 2^m = 3^{n+2} - 3^n$ $2^m(2+1) = 3^n(3^2 - 1)$ $2^m(3) = 3^n(8)$ $2^m(3) = 3^n(2^3)$ $\therefore m = 3 \text{ and } n = 1$ $\therefore m + n = 4$ OR/OF $2^{m+1} + 2^m = 3^{n+2} - 3^n$ $2^m(2+1) = 3^n(3^2 - 1)$ $2^m(3) = 3^n(8)$ $2^m(3) = 3^n(2^3)$ $2^{m-3} = 3^{n-1}$ Only true if $m - 3 = 0$ and $n - 1 = 0$ $\therefore m + n = 4$	$\checkmark$ factors $\checkmark 2^m(3) = 3^n(2^3)$ (same bases) $\checkmark m = 3 \text{ and } n = 1$ $\checkmark m + n = 4$ (4) OR/OF $\checkmark$ factors $\checkmark 2^m(3) = 3^n(2^3)$ (same bases) $\checkmark m - 3 = 0 \text{ and } n - 1 = 0$ $\checkmark m + n = 4$ (4)
		[24]

4. Toon dat 'n uitdrukking altyd ewe is, dan twee eksponensiële onbekendes

Amptelike DBE-nasienriglyn · November 2022 · V1 · 25 punte

QUESTION1/VRAAG 1

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

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

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

	OR/OF $\frac{3^{y+1}}{32} = \sqrt{96^x}$ $\left(\frac{3^{y+1}}{2^5}\right)^2 = \left(\sqrt{(96)^x}\right)^2$ $\frac{3^{2y+2}}{2^{10}} = 2^{5x} \cdot 3^x$ $3^{2y+2} \cdot 2^{-10} = 2^{5x} \cdot 3^x$ $-10 = 5x$ $\therefore x = -2$ $2y + 2 = -2$ $\therefore y = -2$	OR/OF $\checkmark \left(\frac{3^{y+1}}{2^5}\right)^2 = \left(\sqrt{(96)^x}\right)^2$ $\checkmark 3^{2y+2} \cdot 2^{-10} = 2^{5x} \cdot 3^x$ $\checkmark x = -2$ $\checkmark y = -2 \quad (4)$
		[25]

5. 'n Reghoek uit sy omtrek en oppervlakte, dan 'n deelbaarheidsbewys

Amptelike DBE-nasienriglyn · Mei/Junie 2025 · V1 · 25 punte

QUESTION 1/VRAAG 1

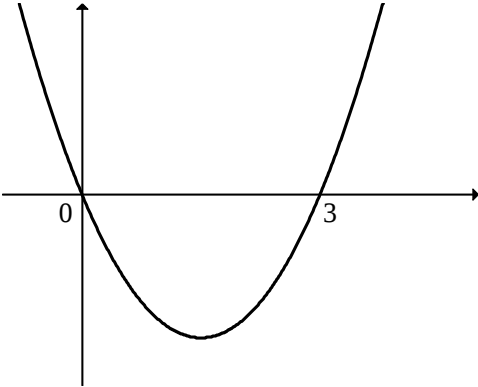
1.1.1	$x^2 - 3x - 10 = 0$ $(x + 2)(x - 5) = 0$ $x = -2$ or $x = 5$	✓ factors/formula ✓ answer ✓ answer (3)
1.1.2	$3x^2 + 6x + 1 = 0$ $x = \frac{-(6) \pm \sqrt{(6)^2 - 4(3)(1)}}{2(3)}$ $x = -1,82$ or $x = -0,18$	✓ correct substitution into correct formula ✓ answer ✓ answer (3)
1.1.3	$2^{x+4} + 2^x = 8704$ $2^x(16 + 1) = 8704$ $2^x = 512$ OR/OF $2^x = 512$ $= 2^9$ $x = 9$ $x = \log_2 512 = 9$	✓ factorisation ✓ simplify to exponential eq ✓ answer (3)
1.1.4	$(x - 8)(x + 2) \leq 0$ CV: $x = 8$ or $x = -2$ $\therefore -2 \leq x \leq 8$ OR/OF $x \in [-2; 8]$	✓ critical values ✓✓ answer (3)
1.1.5	$x + 3\sqrt{x+2} = 2$ $3\sqrt{x+2} = 2 - x$ $9(x+2) = 4 - 4x + x^2$ $x^2 - 13x - 14 = 0$ $(x - 14)(x + 1) = 0$ $x \neq 14$ or $x = -1$	✓ isolating the surd ✓ squaring both sides(method) ✓ standard form ✓ answer with selection (4)

1.2	$(y-3)(x+2) = 32$ $yx + 2y - 3x - 6 = 32 \quad \dots(1)$ $2(y-3) + 2(x+2) = 24$ $y + x - 1 = 12$ $y = 13 - x \quad \dots(2)$ $(13-x)x + 2(13-x) - 3x - 6 = 32$ $13x - x^2 + 26 - 2x - 3x - 6 - 32 = 0$ $-x^2 + 8x - 12 = 0$ $x^2 - 8x + 12 = 0$ $(x-6)(x-2) = 0$ $x = 6 \quad \text{or} \quad x = 2$ $y = 13 - 6 \quad \text{or} \quad y = 13 - 2$ $y = 7 \quad \quad \quad y = 11$ OR/OF $(y-3)(x+2) = 32$ $yx + 2y - 3x - 6 = 32 \quad \dots(1)$ $2(y-3) + 2(x+2) = 24$ $y + x - 1 = 12$ $x = 13 - y \quad \dots(2)$ $y(13-y) + 2y - 3(13-y) - 6 = 32$ $13y - y^2 + 2y - 39 + 3y - 6 - 32 = 0$ $-y^2 + 18y - 77 = 0$ $y^2 - 18y + 77 = 0$ $(y-7)(y-11) = 0$ $y = 7 \quad \text{or} \quad y = 11$ $x = 13 - 7 \quad \text{or} \quad x = 13 - 11$ $x = 6 \quad \quad \quad x = 2$	✓ setting up eq 1 (Area) ✓ setting up eq 2 (Perimeter) ✓ substitution ✓ standard form ✓ x-values ✓ y-values (6) OR/OF ✓ setting up eq 1 (Area) ✓ setting up eq 2 (Perimeter) ✓ substitution ✓ standard form ✓ y-values ✓ x-values (6)
1.3	$(1+x^m+x^{-n})^2 - (1-x^m-x^{-n})^2$ $= [1+x^m+x^{-n} - (1-x^m-x^{-n})][1+x^m+x^{-n} + (1-x^m-x^{-n})]$ $= (2)(2x^m + 2x^{-n})$ OR/OF $(1+x^m+x^{-n})^2 = 1+x^m+x^{-n}+x^m+x^{2m}+x^{m-n}+x^{-n}+x^{m-n}+x^{-2n}$ $\quad \quad \quad = 1+2x^m+2x^{-n}+2x^{m-n}+x^{2m}+x^{-2n}$ $(1-x^m-x^{-n})^2 = 1-2x^m-2x^{-n}+2x^{m-n}+x^{2m}+x^{-2n}$ $(1+x^m+x^{-n})^2 - (1-x^m-x^{-n})^2 = 4x^m+4x^{-n}$ $\quad \quad \quad = 4(x^m+x^{-n})$ $\quad \quad \quad = (2)(2x^m+2x^{-n})$	✓ factorisation ✓ 2 ✓ $(2x^m + 2x^{-n})$ (3) OR/OF ✓ expansion ✓ 4 ✓ $(x^m + x^{-n})$ (3)

6. 'n Substitusie in 'n eksponensiële vergelyking, dan 'n verhouding van magte van 2

Amptelike DBE-nasienriglyn · Mei/Junie 2022 · V1 · 26 punte

QUESTION/VRAAG 1

1.1.1	$x^2 + 2x - 15 = 0$ $(x + 5)(x - 3) = 0$ $x = -5$ or $x = 3$	✓ factors ✓ $x = -5$ ✓ $x = 3$ (3)
1.1.2	$5x^2 - x - 9 = 0$ $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(5)(-9)}}{2(5)}$ $x = \frac{1 \pm \sqrt{181}}{10}$ $x = 1,45$ or $x = -1,25$	✓ substitution into the correct formula ✓ $x = 1,45$ ✓ $x = -1,25$ (3)
1.1.3	$x^2 \leq 3x$ $x^2 - 3x \leq 0$ $x(x - 3) \leq 0$  $0 \leq x \leq 3$ OR $x \in [0; 3]$	✓ standard form ✓ factors ✓✓ answer (4)
1.2.1	$a + \frac{64}{a} = 16$ $a^2 - 16a + 64 = 0$ $(a - 8)^2 = 0$ $a = 8$	✓ standard form ✓ factors ✓ answer (3)

1.2.2	$2^x + 2^{6-x} = 16$ $2^x + \frac{64}{2^x} = 16$ $2^x = 8$ (from 1.2.1) $2^x = 2^3$ $x = 3$	✓ exp law ✓ $2^x = 8$ ✓ answer (3)
1.3	$\sqrt{\frac{2^{1002}(1+2^4)}{17(2)^{998}}}$ $= \sqrt{\frac{2^4(17)}{17}}$ $= \sqrt{2^4}$ $= 2^2$ $= 4$	✓ common factor ✓ second factor ✓ simplification ✓ answer (4)

1.4

$$2x - y = 2 \quad \dots(1)$$

$$\frac{1}{x} - 3y = 1 \quad \dots(2)$$

$$y = 2x - 2$$

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

$$\frac{1}{x} - 6x + 6 - 1 = 0$$

$$1 - 6x^2 + 6x - x = 0$$

$$-6x^2 + 5x + 1 = 0$$

$$6x^2 - 5x - 1 = 0$$

$$(6x + 1)(x - 1) = 0$$

$$x = -\frac{1}{6} \quad \text{or} \quad x = 1$$

$$y = 2\left(-\frac{1}{6}\right) - 2 \quad \text{or} \quad y = 2(1) - 2$$

$$y = -\frac{7}{3} \quad \text{or} \quad y = 0$$

$$\checkmark y = 2x - 2$$

$$\checkmark \text{substitution}$$

$$\checkmark \text{simplification}$$

$$\checkmark \text{standard form}$$

$$\checkmark x\text{-values}$$

$$\checkmark y\text{-values}$$

(6)

OR/OF

$$x = \frac{2+y}{2} \dots(1)$$

$$\frac{1}{x} - 3y = 1 \dots(2)$$

$$\frac{1}{\frac{2+y}{2}} - 3y = 1$$

$$\frac{2}{2+y} - 3y = 1$$

$$\frac{2 - 6y - 3y^2}{2+y} = 1$$

$$2 - 6y - 3y^2 = 2 + y$$

$$-3y^2 - 7y = 0$$

$$-y(3y + 7) = 0$$

$$y = 0 \quad \text{or} \quad y = -\frac{7}{3}$$

$$x = 1 \quad \text{or} \quad x = -\frac{1}{6}$$

OR/OF

$$\checkmark x = \frac{2+y}{2}$$

✓substitution

✓simplification

✓standard form

✓y-values

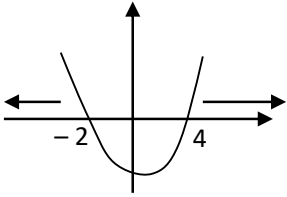
✓x-values

(6)
[26]

7. 'n Eksponensiële vergelyking, dan die produk P maal T

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QUESTION 1/VRAAG 1

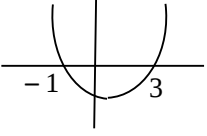
1.1.1	$3x^2 + 5x = 0$ $x(3x + 5) = 0$ $x = 0$ or $x = -\frac{5}{3}$	$\checkmark x = 0$ $\checkmark x = -\frac{5}{3}$ (2)
1.1.2	$4x^2 + 3x - 5 = 0$ $x = \frac{-(3) \pm \sqrt{(3)^2 - 4(4)(-5)}}{2(4)}$ $x = 0,80$ or $x = -1,55$	$\checkmark$ correct substitution into correct formula $\checkmark$ answer $\checkmark$ answer (3)
1.1.3	$(x-1)^2 - 9 \geq 0$ $x^2 - 2x - 8 \geq 0$ $(x-4)(x+2) \geq 0$ $x = 4$ or $x = -2$ $x \leq -2$ or $x \geq 4$	 $\checkmark$ standard form $\checkmark$ critical values $\checkmark\checkmark x \leq -2$ or $x \geq 4$ (4)
1.1.4	$5^{2x} - 5^x = 0$ $5^x(5^x - 1) = 0$ $5^x \neq 0$ or $5^x = 1$ $x = 0$ OR/OF $5^{2x} = 5^x$ $2x = x$ $2x - x = 0$ $x = 0$	$\checkmark$ common factor $\checkmark 5^x \neq 0$ $\checkmark 5^x = 1$ $\checkmark x = 0$ (4) OR/OF $\checkmark 5^{2x} = 5^x$ $\checkmark 2x = x$ $\checkmark 2x - x = 0$ $\checkmark x = 0$ (4)

1.1.5	$\frac{x}{\sqrt{20-x}} = 1$ $x = \sqrt{20-x}$ $x^2 = 20-x$ $x^2 + x - 20 = 0$ $(x+5)(x-4) = 0$ $x = 4 \text{ or } x \neq -5$	✓ isolating the surd ✓ squaring both sides ✓ standard form ✓ answers ✓ selection
		(5)
1.2	$2x^2 - y^2 = 7 \quad \dots (1)$ $x + y = 9 \quad \dots (2)$ $y = 9 - x$ $2x^2 - (9 - x)^2 = 7$ $2x^2 - 81 + 18x - x^2 = 7$ $x^2 + 18x - 88 = 0$ $(x+22)(x-4) = 0$ $x = -22 \text{ or } x = 4$ $y = 31 \text{ or } y = 5$ OR/OF $2x^2 - y^2 = 7 \quad \dots (1)$ $x + y = 9 \quad \dots (2)$ $x = 9 - y$ $2(9 - y)^2 - y^2 = 7$ $2(81 - 18y + y^2) - y^2 - 7 = 0$ $162 - 36y + 2y^2 - y^2 - 7 = 0$ $y^2 - 36y + 155 = 0$ $(y-31)(y-5) = 0$ $y = 31 \text{ or } y = 5$ $x = -22 \text{ or } x = 4$	✓ $y = 9 - x$ ✓ substitution ✓ standard form ✓ x-values ✓ y-values OR/OF ✓ $x = 9 - y$ ✓ substitution ✓ standard form ✓ y-values ✓ x-values
		(5)
1.3	$P \times T = (1-a)(1+a)(1+a^2)(1+a^4) \dots (1+a^{512})$ $P \times T = (1-a^2)(1+a^2)(1+a^4) \dots (1+a^{512})$ $P \times T = (1-a^4)(1+a^4) \dots (1+a^{512})$ $P \times T = (1-a^8) \dots (1+a^{512})$ $P \times T = (1-a^{512})(1+a^{512})$ $= 1 - a^{1024}$	✓ $(1-a^4)$ ✓ $(1-a^{512})$ ✓ $1 - a^{1024}$
		(3)
		[26]

8. 'n Gelyktydige paar, dan wanneer 'n oneindige produk 'n heelgetal bly

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QUESTION 1/VRAAG 1

1.1.1	$x(x-3) = 0$ $x = 0$ or $x = 3$	✓ $x = 0$ ✓ $x = 3$ (2)
1.1.2	$2x^2 - 4x + 1 = 0$ $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(1)}}{2(2)}$ $x = 1,71$ or $x = 0,29$ Answer only: $\frac{4}{4}$	✓ standard form ✓ correct substitution in correct formula ✓ answer ✓ answer (4)
1.1.3	$x^2 - 2x - 3 > 0$ $(x-3)(x+1) > 0$ CV: $x = 3$ or $x = -1$  Answer only: $\frac{3}{4}$ $x < -1$ or $x > 3$ OR/OF $x \in (-\infty; -1) \cup (3; \infty)$	✓ factors ✓ critical values ✓✓ answer (4)
1.1.4	$2^{2x} - 2^{x+2} - 32 = 0$ $2^{2x} - 2^2 \cdot 2^x - 32 = 0$ $(2^x - 8)(2^x + 4) = 0$ $2^x = 8$ or $2^x \neq -4$ $2^x = 2^3$ no solution $x = 3$ Answer only: $\frac{1}{5}$	✓ use of exponential law ✓ factors ✓ $2^x = 8$ ✓ $2^x \neq -4$ ✓ answer (5)
1.1.5	$\sqrt{-2x+4} - x = 2$ $\sqrt{-2x+4} = 2+x$ $(\sqrt{-2x+4})^2 = (2+x)^2$ $-2x+4 = 4+4x+x^2$ $x^2+6x=0$ $x(x+6)=0$ $x=0$ or $x \neq -6$	✓ isolating the root ✓ squaring both sides ✓ standard form ✓ answers with selection (4)

1.2	$y = 3 - 2x \quad \dots (1)$ $y^2 + xy = 2 \quad \dots (2)$ Subs (1) into (2): $(3 - 2x)^2 + (3 - 2x)x = 2$ $4x^2 - 12x + 9 - 2x^2 + 3x - 2 = 0$ $2x^2 - 9x + 7 = 0$ $(2x - 7)(x - 1) = 0$ $x = \frac{7}{2} \quad \text{or} \quad x = 1$ $y = -4 \quad y = 1$ OR/OF $x = \frac{3 - y}{2} \quad \dots (1)$ $y^2 + xy = 2 \quad \dots (2)$ Subs (1) into (2): $y^2 + \left(\frac{3 - y}{2}\right)y = 2$ $2y^2 + 3y - y^2 - 4 = 0$ $y^2 + 3y - 4 = 0$ $(y + 4)(y - 1) = 0$ $y = -4 \quad \text{or} \quad y = 1$ $x = \frac{7}{2} \quad \text{or} \quad x = 1$	✓ eq 1 ✓ substitution ✓ standard form ✓ both x-values ✓ both y-values (5) OR/OF ✓ eq 1 ✓ substitution ✓ standard form ✓ both y-values ✓ both x-values (5)
1.3	$\text{Product} = \frac{3}{2} \times \frac{4}{3} \times \frac{5}{4} \times \dots \times \frac{n}{n-1} \times \frac{n+1}{n} = \frac{n+1}{2}$ The product will be an integer value when $n + 1$ is divisible by 2 i.e. $n \in \{3; 5; 7; \dots\}$ Therefore, n must be an odd number, greater than 2. OR/OF For $n = 2$ the product is $\frac{3}{2}$ For $n = 3$ the product is $\left(\frac{3}{2}\right)\left(\frac{4}{3}\right) = 2$ For $n = 4$ the product is $\left(\frac{3}{2}\right)\left(\frac{4}{3}\right)\left(\frac{5}{4}\right) = \frac{5}{2}$ For $n = 5$ the product is $\left(\frac{3}{2}\right)\left(\frac{4}{3}\right)\left(\frac{5}{4}\right)\left(\frac{6}{5}\right) = 3$ $n \in \{3; 5; 7; \dots\}$ Therefore, n must be an odd number, greater than 2.	✓ $\frac{3}{2} \times \frac{4}{3} \times \frac{5}{4} \times \dots \times \frac{n+1}{n}$ ✓ statement $\left(\frac{n+1}{2}\right)$ ✓ n is odd for $n > 2$ (3) OR/OF ✓ generation of the four products ✓ identifying the pattern when n is odd ✓ n is odd for $n > 2$ (3)