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Gr. 11

Totaal: 70  
Tyd: 1,5 uur

Kwartaal 1, Toets, 2026 – Memorandum  
EkspONENTE, wortelvorme, vergelykings, ongelykhede en aard van wortels

**VRAAG 1**

Vereenvoudig, sonder die gebruik van 'n sakrekenaar. Laat alle antwoorde met positiewe eksponente.

1.1  $\frac{(x^{-1}+y^{-1})}{2x+\sqrt{4y^2}}$  (4)

$$= \left(\frac{1}{x} + \frac{1}{y}\right) \div (2x + 2y \checkmark)$$

$$= \frac{y+x}{xy} \checkmark \times \frac{1}{2(x+y)} \checkmark$$

$$= \frac{1}{2xy} \checkmark$$

1.2  $\frac{6^{a+1} \cdot 12^{-a-3}}{36^{1-a} \cdot 2^{1+a} \cdot 9^a}$  (6)

$$= \frac{(2 \cdot 3)^{a+1} \cdot (2^2 \cdot 3)^{-a-3}}{(2^2 \cdot 3^2)^{1-a} \cdot 2^{1+a} \cdot (3^2)^a}$$

$$= \frac{2^{a+1} \cdot 3^{a+1} \checkmark \cdot 2^{-2a-6} \cdot 3^{-a-3} \checkmark}{2^{2-2a} \cdot 3^{2-2a} \checkmark \cdot 2^{1+a} \cdot 3^{2a} \checkmark}$$

$$= 2^{a+1-2a-6-2+2a-1-a} \cdot 3^{a+1-a-3-2+2a-2a} \checkmark$$

$$= 2^{-8} \cdot 3^{-4}$$

$$= \frac{1}{2^8 \cdot 3^4} \checkmark$$

OF

$$= \frac{1}{20736} \checkmark$$

1.3  $\frac{(\sqrt{2})^{2025} + (\sqrt{2})^{2026}}{(\sqrt{2})^{2023} + (\sqrt{2})^{2024}}$  (3)

$$= \frac{(\sqrt{2})^{2025}(1+\sqrt{2}) \checkmark}{(\sqrt{2})^{2023}(1+\sqrt{2}) \checkmark}$$

$$= (\sqrt{2})^2$$

$$= 2 \checkmark$$

$$1.4 \quad \frac{\sqrt{32}-\sqrt{72}+\sqrt{8}+\sqrt{18}}{\sqrt{162}} \quad (4)$$

$$= \frac{\sqrt{2 \cdot 16} - \sqrt{2 \cdot 36} + \sqrt{2 \cdot 4} + \sqrt{2 \cdot 9}}{\sqrt{2 \cdot 81}}$$

$$= \frac{4\sqrt{2} - 6\sqrt{2} + 2\sqrt{2} + 3\sqrt{2}}{9\sqrt{2}}$$

$$= \frac{3\sqrt{2}}{9\sqrt{2}}$$

$$= \frac{1}{3}$$

$$1.5 \quad \frac{3\sqrt{12}}{-2+\sqrt{3}} + \frac{\sqrt{27}}{\sqrt{3}+2} \quad (6)$$

$$= \frac{3\sqrt{3 \cdot 4}(\sqrt{3}+2) + \sqrt{9 \cdot 3}(\sqrt{3}-2)}{(\sqrt{3}-2)(\sqrt{3}+2)}$$

$$= \frac{6\sqrt{3}(\sqrt{3}+2) + 3\sqrt{3}(\sqrt{3}-2)}{3-4}$$

$$= \frac{18+12\sqrt{3} + 9-6\sqrt{3}}{-1}$$

$$= -(27 + 6\sqrt{3})$$

$$= -27 - 6\sqrt{3}$$

$$1.6 \quad \frac{\sqrt{81} \times (\sqrt[3]{3})^4}{\sqrt{300-57}} \quad (4)$$

$$= \frac{\sqrt{3^4} \times (3^{\frac{1}{3}})^4}{\sqrt{243}}$$

$$= \frac{3^2 \times 3^{\frac{4}{3}}}{\sqrt{3^5}}$$

$$= \frac{3^2 \times 3^{\frac{4}{3}}}{3^{\frac{5}{2}}}$$

$$= 3^{2 + \frac{4}{3} - \frac{5}{2}}$$

$$= 3^{\frac{5}{6}}$$

[27]

## VRAAG 2

2.1 Los op vir  $x$ :

$$2.1.1 \quad 3x(3-x) = 1 \quad [\text{Korrek tot twee desimale syfers}] \quad (4)$$

$$9x - 3x^2 - 1 = 0$$

$$-3x^2 + 9x - 1 = 0$$

$$x = \frac{-9 \pm \sqrt{(9)^2 - 4(-3)(-1)}}{2(-3)}$$

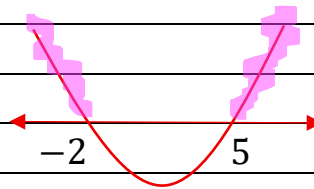
$$x = 2,88 \text{ of } x = 0,12$$

$$2.1.2 \quad x(x - 3) \geq 10 \quad (4)$$

$$x^2 - 3x - 10 \geq 0 \quad \checkmark$$

$$(x - 5)(x + 2) \geq 0 \quad \checkmark$$

$$x \geq 5 \quad \checkmark \cup x \leq -2 \quad \checkmark$$



$$2.1.3 \quad 5^{-x-2} + \frac{5}{5^x} - \left(\frac{1}{5}\right)^{x+1} = \frac{121}{625} \quad (6)$$

$$5^{-x-2} + 5^{-x+1} \quad \checkmark - 5^{-x-1} \quad \checkmark = \frac{121}{625}$$

$$5^{-x}(5^{-2} + 5 - 5^{-1}) \quad \checkmark = \frac{121}{625}$$

$$5^{-x} \left(\frac{121}{25}\right) = \frac{121}{625}$$

$$5^{-x} = \frac{1}{25} \quad \checkmark$$

$$5^{-x} = 5^{-2} \quad \checkmark$$

$$-x = -2$$

$$x = 2 \quad \checkmark$$

$$2.1.4 \quad \sqrt{4x + 12} - x - 2 = 0 \quad (4)$$

$$(\sqrt{4x + 12})^2 = (x + 2)^2$$

$$4x + 12 \quad \checkmark = x^2 + 4x + 4 \quad \checkmark$$

$$x^2 = 8 \quad \checkmark$$

$$x = 2\sqrt{2} \quad \checkmark \text{ of } x = -2\sqrt{2}$$

$$2.1.5 \quad 2x^2 - 4x = 1 \quad [\text{Los op m.b.v. vierkantsvoltooiing}] \quad (4)$$

$$x^2 - 2x = \frac{1}{2} \quad \checkmark$$

$$x^2 - 2x + (-1)^2 = \frac{1}{2} + (-1)^2 \quad \checkmark$$

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

$$x = \pm \sqrt{\frac{3}{2}} + 1 \quad \checkmark \text{ beide oplossings}$$

OF

$$x = 2,22 \text{ of } x = -0,22 \quad \checkmark \text{ beide oplossings}$$

$$2.2 \quad \text{Los vir } x \text{ en } y \text{ gelyktydig op, indien: } y + 1 = 2x \text{ en } y^2 - 5 = 3x^2 - 7x \quad (7)$$

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

Stel (1) in (2):

$$(2x - 1)^2 \quad \checkmark - 5 = 3x^2 - 7x$$

$$4x^2 - 4x + 1 - 5 - 3x^2 + 7x = 0$$

$$x^2 + 3x - 4 = 0 \quad \checkmark$$

$$(x + 4)(x - 1) = 0 \quad \checkmark$$

$$x = -4 \text{ of } x = 1 \quad \checkmark \text{ beide oplossings}$$

$$\therefore y = 2(-4) - 1 = -9 \quad \checkmark \text{ of } y = 2(1) - 1 = 1 \quad \checkmark$$

### VRAAG 3

- 3.1 Sonder om die vergelyking op te los, bespreek volledig die aard van die wortels van  $2x^2 + 3x - 5 = 0$ . (3)

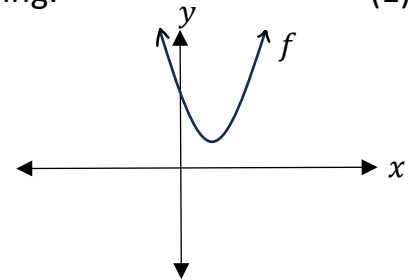
$$\Delta = (3)^2 - 4(2)(-5) \checkmark$$

$$\Delta = 49 \checkmark$$

Wortels is reëel, rasionaal en ongelyk  $\checkmark$

- 3.2 Skryf slegs WAAR of VALS neer langsaaan die volgende stelling: Die meegaande funksie  $f(x)$  het geen reële wortels nie. (1)

Waar  $\checkmark$



- 3.3 Beskou die volgende vergelyking:  $(x + a)(x + b) = c^2$

- 3.3.1 Toon aan dat die wortels van die vergelyking altyd reëel sal wees vir alle reële waardes van  $a$ ,  $b$  en  $c$ . (5)

$$x^2 + (a + b)x + ab = c^2 \checkmark \text{ uitbrei}$$

$$x^2 + (a + b)x + ab - c^2 = 0 \checkmark \text{ standaardvorm}$$

$$\Delta = (a + b)^2 - 4(1)(ab - c^2) \checkmark$$

$$\Delta = a^2 + 2ab + b^2 - 4ab + 4c^2$$

$$\Delta = a^2 - 2ab + b^2 + 4c^2$$

$$\Delta = (a - b)^2 + 4c^2 \checkmark$$

$$\therefore (a - b)^2 \geq 0 \text{ vir } a, b \in R \text{ en } 4c^2 \geq 0 \text{ vir } c \in R$$

$$\therefore \Delta \geq 0 \text{ vir } a, b \text{ en } c \in R \checkmark$$

- 3.3.2 Vir watter waardes van  $a$ ,  $b$  en  $c$  sal die vergelyking gelyke wortels hê? (5)

$$\text{Vir gelyke wortels is } \Delta = 0 \checkmark$$

$$(a - b)^2 + 4c^2 = 0$$

$$(a - b)^2 = 0 \checkmark \text{ en } 4c^2 = 0 \checkmark$$

$$a = b \checkmark \quad c = 0 \checkmark$$

[14]

Totaal: [70]