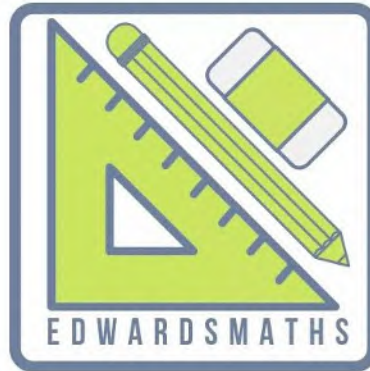


Examiner:

Moderator:

Total: 50

Time: 1 hour



This paper consists of 2 pages.

INSTRUCTIONS AND INFORMATION

1. Read the following instructions carefully before answering the questions.
2. This question paper consists of 2 questions.
3. Answer ALL the questions.
4. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. Number the answers correctly according to the numbering system used in this question paper.
10. Write neatly and legibly.

Question 1

1.1 Solve for x in each of the following:

1.1.1 $x(2x + 1) = 0$ (2)

1.1.2 $5x^2 + 2x - 6 = 0$ (correct to TWO decimal places) (3)

1.1.3 $2x^2 - 2 \geq 3x$ (4)

1.1.4 $\sqrt{2x + 5} - \frac{3}{\sqrt{2x+5}} = -2$ (6)

1.2 Solve for x and y simultaneously if:

$$x + 4 = 2y \text{ and } y^2 - xy + 21 = 0 \quad (6)$$

1.3 The roots of the equation $f(x) = 0$ are $x = \frac{4 \pm \sqrt{16 - 4m(-m+5)}}{2m}$

Determine the values of m for which the roots will be non-real. (5)

1.4 Show that the maximum value of $\sqrt{-x^2 + 4x + 12}$ is 4 (4)

[30]

Question 2

2.1 Simplify fully, WITHOUT using a calculator: $\frac{3^{2x+1} \cdot 15^{2x-3}}{27^{x-1} \cdot 3^x \cdot 5^{2x-4}}$ (4)

2.2 Solve for x :


2.2.1 $\left(\frac{1}{2}\right)^x = 32$ (3)

2.2.2 $\sqrt[3]{\frac{1}{x^2}} = 4$ (3)

2.2.3 $2^x - \frac{12}{2^x} = -4$ (5)

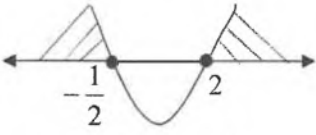
2.3 WITHOUT using a calculator, show that $\frac{\sqrt{2}}{\sqrt{2}+1} + \frac{4}{\sqrt{2}}$ simplifies to $2 + \sqrt{2}$. (5)

[20]

<u>Graad 11 Wiskunde</u> <u>Toets/Opdrag-Memo</u> <u>Kwartaal 1-2022</u>	<u>Grade 11 Mathematics</u> <u>Test/Assignment-Memo</u> <u>Term 1-2022</u>
Eksaminator: Moderator: Totaal : 50 Tyd: 1 uur	Examiner: Moderator: Total: 50 Time: 1 hour
	

Vraag 1/Question 1

1.1.1	$x(2x + 1) = 0$ $x = 0$ or / of $x = -\frac{1}{2}$	<input type="checkbox"/> $x = 0$ <input type="checkbox"/> $x = -\frac{1}{2}$	(2)
1.1.2	$5x^2 + 2x - 6 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(2) \pm \sqrt{(2)^2 - 4(5)(-6)}}{2(5)}$ $= \frac{5 \pm \sqrt{124}}{10}$ $x = 0,91$ or/of $x = -1,31$	<input type="checkbox"/> substitution into correct formula/vervanging in korrekte formule <input type="checkbox"/> answer/antw. <input type="checkbox"/> answer/antw.	(3)

1.1.3	$2x^2 - 2 \geq 3x$ $2x^2 - 3x - 2 \geq 0$ $(2x + 1)(x - 2) \geq 0$  $x \leq -\frac{1}{2} \text{ or/of } x \geq 2$	<input checked="" type="checkbox"/> std form/stand. vorm <input checked="" type="checkbox"/> factors or using formula/ faktore of gebruik formule <input checked="" type="checkbox"/> $x \leq -\frac{1}{2}$ or / of $x \geq 2$	(4)
1.1.4	$\sqrt{2x+5} - \frac{3}{\sqrt{2x+5}} = -2$ <p>Let $\sqrt{2x+5} = k$</p> $k - \frac{3}{k} = -2$ $k^2 - 3 = -2k$ $k^2 + 2k - 3 = 0$ $(k+3)(k-1) = 0$ $k = -3 \text{ or/of } k = 1$ $\sqrt{2x+5} = -3 \quad \text{or/of} \quad \begin{aligned} \sqrt{2x+5} &= 1 \\ 2x+5 &= 1 \\ 2x &= -4 \\ x &= -2 \end{aligned}$ <p>no solution</p>	<input checked="" type="checkbox"/> changing to quadratic/ verander na kwadraties <input checked="" type="checkbox"/> factors or using formula/ faktore of gebruik formule <input checked="" type="checkbox"/> $k = 3$ or/of $k = 1$ <input checked="" type="checkbox"/> no solution/ geen oplossing <input checked="" type="checkbox"/> square both sides/ kwadreer beide kante <input checked="" type="checkbox"/> $x = -2$	(6)
1.2	$x + 4 = 2y \text{ and } y^2 - xy + 21 = 0$ $\therefore x = 2y - 4$ $y^2 - (2y - 4)y + 21 = 0$ $y^2 - 2y^2 + 4y + 21 = 0$ $-y^2 + 4y + 21 = 0$ $y^2 - 4y - 21 = 0$ $(y - 7)(y + 3) = 0$ $y = 7 \text{ or } y = -3$ $x = 2(7) - 4 \text{ or } x = 2(-3) - 4$ $x = 10 \text{ or } x = -10$	<input checked="" type="checkbox"/> $x = 2y - 4$ <input checked="" type="checkbox"/> substitution/verv. <input checked="" type="checkbox"/> std form / stand. Vorm <input checked="" type="checkbox"/> factors or using formula/ faktore of gebruik formule <input checked="" type="checkbox"/> y-values/wrdes <input checked="" type="checkbox"/> x-values/wrdes	(6)

1.3	$x = \frac{4 \pm \sqrt{16 - 4m(-m + 5)}}{2m}$ <p>For non-real roots: $16 - 4m(-m + 5) < 0$</p> $16 + 4m^2 - 20m < 0$ $m^2 - 5m + 4 < 0$ $(m - 4)(m - 1) < 0$ $1 < m < 4$	$\sqrt{16 - 4m(-m + 5)} < 0$ <p>\checkmark factors or using formula / faktore of gebruik formule</p> $\sqrt{1} < m < 4$	(5)
1.4	$-x^2 + 4x + 12$ $= -1(x^2 - 4x - 12)$ $= -1(x^2 - 4x + 4 - 4 - 12)$ $= -1(x - 2)^2 + 16$ <p>The maximum value $-x^2 + 4x + 12$ is 16 \therefore max value of $\sqrt{-x^2 + 4x + 12}$ is 4</p> <p>OR/OF</p> $\sqrt{-x^2 + 4x + 12}$ <p>max when $x = \frac{-b}{2a}$</p> $= \frac{-4}{2(-1)}$ $= 2$ <p>max value $y = -(2)^2 + 4(2) + 12$</p> $= 16$ <p>max value $y = -(2)^2 + 4(2) + 12$</p> $= 16$ <p>The maximum value of $-x^2 + 4x + 12$ is 16 \therefore max value of $\sqrt{-x^2 + 4x + 12}$ is 4</p>	$\boxtimes -1(x^2 - 4x - 12)$ $\boxtimes -1(x^2 - 4x + 4 - 4 - 12)$ $\boxtimes -1(x - 2)^2 + 16$ $\boxtimes \sqrt{16} = 4$ <p>OR /OF</p> $\boxtimes \text{subst/verv.}$ $\boxtimes x\text{-value/waarde}$ $\boxtimes y\text{-value/waarde}$ $\boxtimes \sqrt{16} = 4$	(4) [30]

Vraag 2/Question 2			
2.1	$\frac{3^{2x+1} \cdot 15^{2x-3}}{27^{x-1} \cdot 3^x \cdot 5^{2x-4}}$ $= \frac{3^{2x+1} \cdot 3^{2x-3} \cdot 5^{2x-3}}{3^{3x-3} \cdot 3^x \cdot 5^{2x-4}}$ $= 3^{2x+1+2x-3-3x+3-x} \cdot 5^{2x-3-2x+4}$ $= 3 \cdot 5$ $= 15$	<p>✓prime bases/priembasis</p> <p>✓base/basis 3</p> <p>✓adding and subtracting exponents/optel en aftrek van eksponente</p> <p>✓answer/antw.</p>	(4)
2.2.1	$\left(\frac{1}{2}\right)^x = 32$ $\left(\frac{1}{2}\right)^x = 2^5$ $2^{-x} = 2^5$ $-x = 5$ $x = -5$ <p>OR/OF</p> $\left(\frac{1}{2}\right)^x = 32$ $\left(\frac{1}{2}\right)^x = 2^5$ $\left(\frac{1}{2}\right)^x = \left(\frac{1}{2}\right)^{-5}$ $x = -5$	<p>✓same base/dieselfde basis</p> <p>✓equating indices/gelykstelling van eksponente ✓answer/antw.</p> <p>OR /OF</p> <p>✓same base/dieselfde basis</p> <p>✓simplification/vereenv</p> <p>✓answer/antw.</p>	(3)
2.2.2	$\sqrt[3]{\frac{1}{x^2}} = 4$ $x^{-\frac{2}{3}} = 2^2$ $x = (2^2)^{-\frac{3}{2}}$ $x = 2^{-3}$ $x = \frac{1}{8}$	<p>✓exp form/eksp. Vorm</p> <p>✓$x = (2^2)^{-\frac{3}{2}}$</p> <p>✓answer/antw.</p>	(3)

2.2.3	$2^x - \frac{12}{2^x} = -4$ $(2^x)^2 - 12 = -4 \cdot 2^x$ $(2^x)^2 + 4 \cdot 2^x - 12 = 0$ $(2^x + 6)(2^x - 2) = 0$ $2^x \neq -6 \text{ or } 2^x = 2$ <p>no solution/geen oplossing or/of $x = 1$</p> <p>OR/OF</p> <p>Let $2^x = k$</p> $k - \frac{12}{k} = -4$ $k^2 - 12 = -4k$ $k^2 + 4k - 12 = 0$ $(k - 2)(k + 6) = 0$ $k = 2 \text{ or } k = -6$ $2^x = 2 \text{ or } 2^x \neq -6$ $x = 1 \text{ or no solution}$	\checkmark mult by LCD/KGN $\checkmark (2^x)^2 + 4 \cdot 2^x - 12 = 0$ \checkmark factors/faktore $\checkmark 2^x \neq -6$ $\checkmark x = 1$ <p>Or/Of</p> \checkmark mult by LCD/KGN $\checkmark k^2 + 4k - 12 = 0$ \checkmark factors/faktore $\checkmark 2^x \neq -6$ $\checkmark x = 1$	(5)
2.3	$\frac{\sqrt{2}}{\sqrt{2} + 1} + \frac{4}{\sqrt{2}}$ $= \frac{\sqrt{2} \cdot \sqrt{2}}{\sqrt{2}(\sqrt{2} + 1)} + \frac{4(\sqrt{2} + 1)}{\sqrt{2}(\sqrt{2} + 1)}$ $= \frac{(\sqrt{2})^2 + 4\sqrt{2} + 2^2}{2 + \sqrt{2}}$ $= \frac{(\sqrt{2} + 2)^2}{2 + \sqrt{2}}$ $= 2 + \sqrt{2}$	\boxtimes LCD/KGN \boxtimes perfect square trinomial volkome vierkant drieterm \boxtimes simplification denominator vereenvoudigingsnoemer \boxtimes factors/faktore \boxtimes answer/antwoord	(5) [20]