α-MATHEMATICS

Alpha Wiskunde Graad 10 / *Alpha Mathematics Grade 10*

Finale Eksamen 2021 / *Final Examination 2021*

MEMORANDUM

Totaal / *Total*: 120 punte / *marks*

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Moderator: Anna Muller

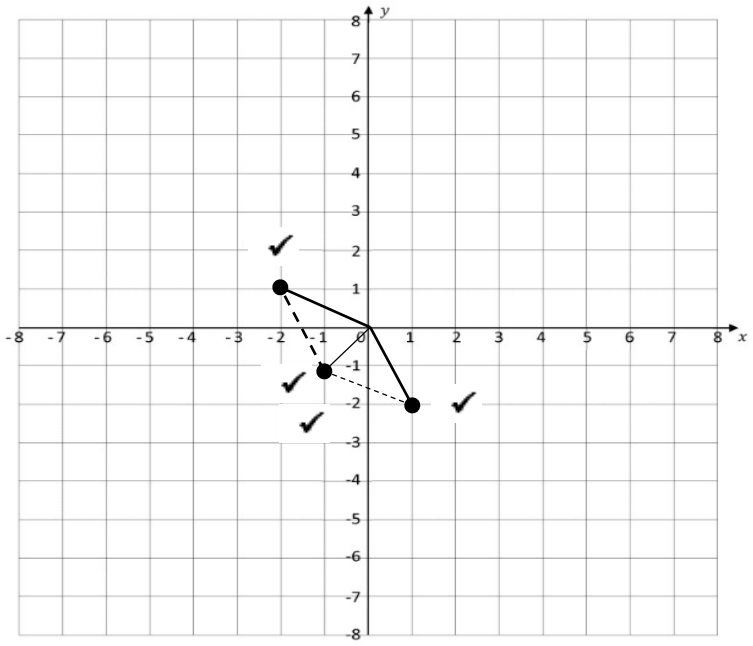
Hierdie memorandum bestaan uit 9 bladsye. /
This memorandum consists of 9 pages.

Vraag / *Question* 1 **[20 punte / *marks*]**

1.1	A	B	C	D
1.2	A	B	C	D
1.3	A	B	C	D
1.4	A	B	C	D
1.5	A	B	C	D
1.6	A	B	C	D
1.7	A	B	C	D
1.8	A	B	C	D
1.9	A	B	C	D
1.10	A	B	C	D

NR. NO	ANTWOORD *ANSWER*	BEREKENINGE (nie vir nasien doeleindes nie) *CALCULATIONS (not for marking purpose)*	PUNTE *MARKS*
1.1	C	$i^5 = i^4.i = i$	**(2)**
1.2	D	$\frac{3}{x^3} \equiv \frac{A}{x} + \frac{B}{x^2} + \frac{C}{x^3}$	**(2)**
1.3	B	$6x^2 + x - 10 = Ax^2 + 5A + 2Bx^2 + Cx$ $5A = -10 \quad \rightarrow A = -2$ $C = 1$ $A + 2B = 6 \quad \rightarrow B = 4$	**(2)**
1.4	B	$2A = \begin{pmatrix} 2 & 6 \\ -4 & 12 \end{pmatrix}$ $x = -4$ and $y = 6$	**(2)**
1.5	C	$C^T = \begin{bmatrix} 1 & 2 \\ 5 & -6 \\ -3 & 4 \end{bmatrix}$	**(2)**
1.6	D	$f'(x) = 0$	**(2)**
1.7	D	$(g \circ f)(x) = \left[\sqrt{x+1}\right]^2 = x + 1$ $g(x) = x^2$	**(2)**
1.8	A	$60° \times \frac{\pi}{180°} = \frac{\pi}{3}$	**(2)**
1.9	D	$\tan\left(\frac{1}{1}\right) = \frac{\pi}{4}$	**(2)**
1.10	B	$u = (2\,;3)$ and $v = -2(2\,;3) = (4\,;-6)$ $\|u\| = \sqrt{2^2 + 3^2} = \sqrt{13}$ $\|v\| = \sqrt{4^2 + (-6)^2} = 2\sqrt{13}$ (i) FALSE (iii) TRUE Vectors have different signs so are in opposite directions hence (ii) TRUE and (iv) FALSE	**(2)**

Vraag / *Question* 2 **[22 punte / *marks*]**

NR. NO	ANTWOORD / *ANSWER*	PUNTE / *MARKS*
2.1		**(4)**
2.2	$b-a$ $=(1-2i)-(-2+i\ )$ ✓ $=1-2i+2-i$ ✓ $=3-3i$ ✓	**(3)**
2.3	$a.a^*$ $=(-2+i)(-2-i)$ ✓ $=4-i^2$ ✓ $=4-(-1)$ ✓ $=5$ ✓	**(4)**
2.4	$Re\left(\frac{b}{a}\right)$ $=Re\left(\frac{1-2i}{-2+i}\right)$ $=Re\left[\left(\frac{1-2i}{-2+i}\right)\times\left(\frac{-2-i}{-2-i}\right)\right]$ ✓ $=Re\left(\frac{-2+3i+2i^2}{4-i^2}\right)$ ✓✓ $=Re\left(\frac{-2+3i+2(-1)}{4-(-1)}\right)$ ✓ $=Re\left(\frac{-4+3i}{5}\right)$ ✓ $=Re\left(-\frac{4}{5}+\frac{3}{5}i\right)$ ✓ $=-\frac{4}{5}$ ✓	**(7)**

NR. NO	ANTWOORD / *ANSWER*	PUNTE / *MARKS*
2.5	$b.\ i^{127}$ $= (1-2i).\ i^{124}.\ i^{3}$✓ $= (1-2i).\ 1.\ -i$✓ $= -i + 2i^{2}$✓ $= -i + 2(-1)$ $= -2 - i$✓	**(4)**

Vraag / *Question* 3 **[12 punte / *marks*]**

ANTWOORD / *ANSWER*	PUNTE / *MARKS*
$\frac{3x^2-1}{(x^2-x)(x-1)} = \frac{3x^2-1}{x(x-1)^2}$✓ $\equiv \frac{A}{x} + \frac{B}{x-1} + \frac{C}{(x-1)^2}$✓ $3x^2 - 1 = A(x-1)^2 + Bx(x-1) + Cx$✓ Let $x = 1$ $2 = C$✓✓ Let $x = 0$ $-1 = A$✓✓ $3x^2 - 1 = Ax^2 - 2Ax + A + Bx^2 - Bx + Cx$✓ $3 = A + B$ $B = 4$✓✓ $\frac{3x^2-1}{(x^2-x)(x-1)} \equiv \frac{-1}{x} + \frac{4}{x-1} + \frac{2}{(x-1)^2}$✓✓	**(12)**

Vraag / *Question* 4 **[9 punte / *marks*]**

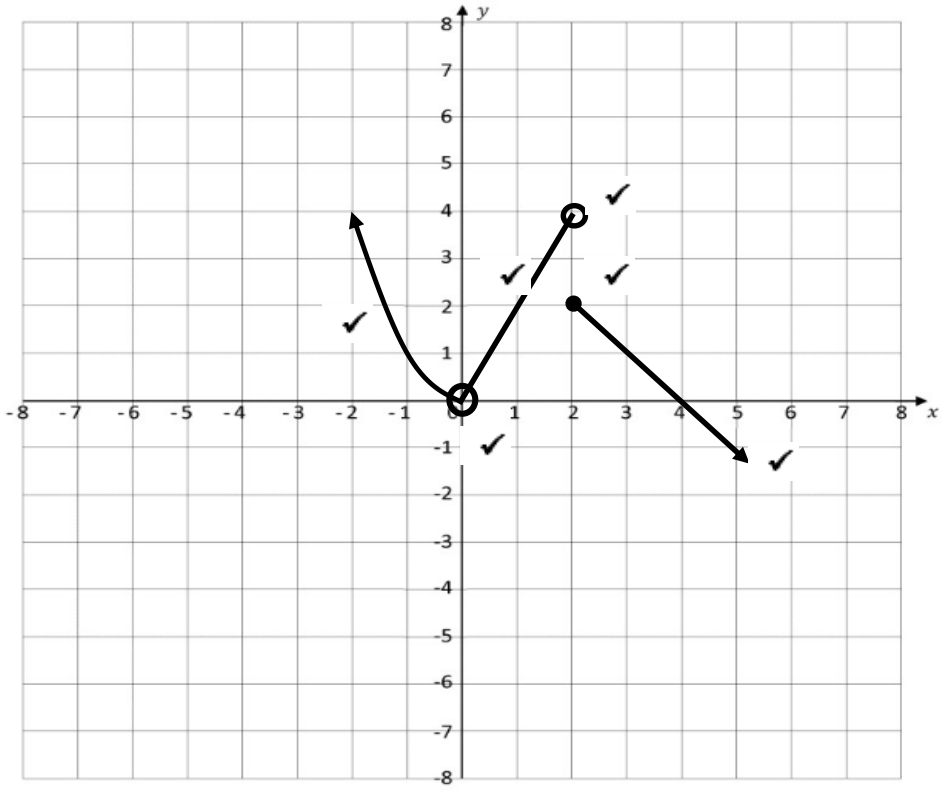
NR. NO	ANTWOORD / *ANSWER*	PUNTE / *MARKS*
4.1	$(-1)^3+(-1)^2+9(-1)+9=0$✓ $x=-1$✓ is a root of $P(x)$.	**(2)**
4.2	$\begin{array}{rr\|llll} & & x^2 & +9 & & \\ x & +1 & x^3 & +x^2 & +9x & +9 \\ & & x^3 & +x^2 & & \\ \hline & & & & 9x & +9 \\ & & & & 9x & +9 \\ \hline & & & & & 0 \end{array}$ OR $\begin{array}{r\|llll} -1 & 1 & 1 & 9 & 9 \\ & & -1 & 0 & -9 \\ \hline & 1 & 0 & 9 & 0 \end{array}$ A quadratic factor is x^2+9✓✓	**(3)** ✓**method** ✓✓**answer**
4.3	$x^3+x^2+9x+9=0$ $(x+1)(x^2+9)=0$✓ $x+1=0$ or $x^2=-9$✓ $x=-1$✓ $x=\pm\sqrt{-9}$ $x=\pm 3i$✓	**(4)**

Vraag / *Question* 5 **[14 punte / *marks*]**

NR. NO	ANTWOORD / *ANSWER*	PUNTE / *MARKS*
5.1	Area sector OAD$=\frac{1}{2}r^2\theta$ $=\frac{1}{2}x^2\theta$✓✓	**(2)**
5.2	Area sector OBC$=\frac{1}{2}r^2\theta$ $=\frac{1}{2}(x+4)^2\theta$✓✓	**(2)**

5.3	Area shaded part$= \frac{1}{2}(x+4)^2\theta - \frac{1}{2}x^2\theta$✓ 64✓ $= \frac{1}{2}\theta(x^2+8x+16-x^2)$✓ $128 = \theta(8x+16)$ ✓ $\theta = \frac{128}{8(x+2)}$✓ $\theta = \frac{16}{(x+2)}$	**(5)**
5.4	$\theta = \frac{16}{2+2}$ $\theta = 4$✓	**(1)**
5.5	$P = AD + 4 + BC + 4$✓ $P = 8 + 2(4)$✓ $+ (2+4)(4)$✓ $P = 40$ cm✓	**(4)**

Vraag / *Question* 6 **[10 punte / *marks*]**

NR. NO	ANTWOORD / *ANSWER*	PUNTE / *MARKS*
6.1		**(6)**
6.2.1	$\tan\frac{\pi}{6} = \frac{\sqrt{3}}{3}$✓✓	**(2)**

NR. NO	ANTWOORD / *ANSWER*	PUNTE / *MARKS*
6.2.2	$\arcsin\frac{1}{2} = \frac{\pi}{6}$✓✓	**(2)**

Vraag / *Question* 7 **[14 punte / *marks*]**

NR. NO	ANTWOORD / *ANSWER*	PUNTE / *MARKS*
7.1	$f(x) = 5.\sqrt[3]{x} - \frac{4}{x^2} + 9$ $f(x) = 5x^{\frac{1}{3}}$✓ $- 4x^{-2}$✓ $+ 9$ $f'(x) = \frac{5}{3}x^{-\frac{2}{3}}$✓ $+ 8x^{-3}$✓	**(4)**
7.2	$\int 6x^5 + 3\sqrt{x} + 2\ dx$ $= \int 6x^5 + 3x^{\frac{1}{2}} + 2\ dx$ $= \frac{6x^6}{6}$✓ $+ 3.\frac{2}{3}x^{\frac{3}{2}}$✓ $+ 2x$✓ $+ k$✓	**(4)**
7.3	$Vol = \pi\int_1^2 \left[\sqrt{3x^2 - 8x + 7}\right]^2 dx$ $Vol = \pi\int_1^2 3x^2 - 8x + 7\ dx$ ✓ $Vol = \pi\left(3.\frac{x^3}{3}\text{✓} - 8.\frac{x^2}{2}\text{✓} + 7x\text{✓}\right)\begin{matrix}2\\1\end{matrix}$ $Vol = \pi(x^3 - 4x^2 + 7x)\begin{matrix}2\\1\end{matrix}$ $Vol = \pi(2^3 - 4(2)^2 + 7(2) - 1^3 + 4(1)^2 - 7(1))$✓ $Vol = 2\pi$ $Vol = 6{,}28\ units^3$✓	**(6)**

Vraag / *Question* 8 **[7 punte / *marks*]**

NR. NO	ANTWOORD / *ANSWER*	PUNTE / *MARKS*
8.1	$\begin{bmatrix}1 & 1\\3 & 2\end{bmatrix}\begin{bmatrix}x\\y\end{bmatrix}$✓ $= \begin{bmatrix}8\\21\end{bmatrix}$✓	**(2)**
8.2	$detA = \begin{vmatrix}1 & 1\\3 & 2\end{vmatrix} = -1$✓ $detA_x = \begin{vmatrix}8 & 1\\21 & 2\end{vmatrix} = -5$✓ $detA_y = \begin{vmatrix}1 & 8\\3 & 21\end{vmatrix} = -3$✓ $x = 5$ ✓ ; $y = 3$✓	**(5)**

Vraag / *Question* 9 **[12 punte / *marks*]**

NR. NO	ANTWOORD / *ANSWER*	PUNTE / *MARKS*
9.1	$\|b\| = \sqrt{7+9} = 4$✓✓	**(2)**
9.2	$\|a\| = \sqrt{64+36} = 10$✓✓	**(2)**
9.3	$a.b = -8\sqrt{7} + 18$✓ $= -3{,}17$✓✓	**(3)**
9.4	No since $a.b \neq 0$. ✓	**(1)**
9.5	$a.b = \|a\|\|b\| \cos\theta$ $-3{,}17 = 4.10.\cos\theta$✓✓ $cos\ \theta = \frac{-3{,}17}{40}$ $\theta = 1{,}65$✓✓	**(4)**

- EINDE VAN DIE MEMORANDUM / *END OF THE MEMORANDUM* -