

# $\alpha$ -WISKUNDE/ MATHEMATICS

21 Oktober 2021/ *October 21, 2021*  
Graad/ Grade 12

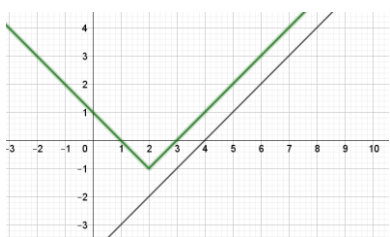
Tyd/ Time: 3 ure/ *hours*  
Totaal/ Total: 200 PUNTE/ *MARKS*

## VRAAG/ QUESTION 1 [20 PUNTE/ MARKS]

1.1	A	B	C	<b>D</b>
1.2	A	<b>B</b>	C	D
1.3	A	B	<b>C</b>	D
1.4	<b>A</b>	B	C	D
1.5	A	B	C	<b>D</b>
1.6	A	B	<b>C</b>	D
1.7	A	B	<b>C</b>	D
1.8	A	B	C	<b>D</b>
1.9	A	<b>B</b>	C	D
1.10	<b>A</b>	B	C	D

**VRAAG/ QUESTION 2 [18 PUNTE/ MARKS]**

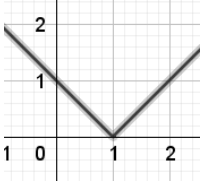
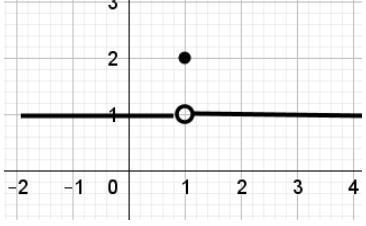
2.1 (a)	$T(0) = 15 + 9 = 24^{\circ}\text{C}$ ✓	1: Anwoord/ Answer [1]
(b)	$15^{\circ}\text{C}$ ✓	1: Anwoord/ Answer [1]
(c)	$20 = 15 + 9e^{-0,3t}$ ✓ $\therefore \frac{5}{9} = e^{-0,3t}$ ✓ $-0,3t = \ln\left(\frac{5}{9}\right)$ ✓ $t = 2 \text{ min}$ ✓	1: Vervang/ Substitute 1: Vereenvoudig/ Simplify  1: Verander na/ Change to ln 1: Anwoord/ Answer [4]
(d)	$T'(t)$ ✓ = $-0,3 \times 9e^{-0,3t}$ ✓ $T(5) = -0,60^{\circ}\text{C}/\text{min}$ ✓	1: Differensieer/ Differentiate 1: Diff reg/ correct 1: Anwoord/ Answer [3]

2.2 (a)	Knakpunt/ Salient point: $(2; -1)$ ✓ y-afsnit/ intercept: $y = 1$ ✓ x-afsnitte/ intercepts: $x - 2 = \pm 1$ ✓ $x = 3$ of/ or $x = 1$ ✓		1: Knakpunt/ Salient point 1: y-afsnit/ intercept 1: x-afsnitte/ intercept 1: Skets/ Sketch [4]
(b)	As $x \geq 2$ : $x - 2 - 1 = x - 4$ ✓ Geen opl./ No sol. ✓	As $x < 2$ ✓ $-x + 2 - 1 = x - 4$ ✓  $2x = 5; x = 2,5$ Geen opl./ No sol. ✓	1: Voorwaardes/ Conditions 1: Vgl/ Eq 1: geen opl/ No sol 1: 2e vgl/ 2nd eq 1: Geen opl/ No sol [5]

3.1 (a)	$-\sqrt{3} + i = 2\text{cis}\left(\frac{5\pi}{6}\right)$ ✓✓	1: r en 1: hoek/ <i>r and angle</i>
(b)	$2 - 2\sqrt{3}i = 4\text{cis}\left(\frac{-\pi}{3}\right)$ of $4\text{cis}\left(\frac{5\pi}{3}\right)$ ✓✓	1: r en 1: hoek/ <i>r and angle</i>
(c)	$\frac{-\sqrt{3}+i}{2-2\sqrt{3}i} = \frac{2\text{cis}\left(\frac{5\pi}{6}\right)}{4\text{cis}\left(\frac{-\pi}{3}\right)} = \frac{1}{2}$ ✓✓ $\text{cis}\left(\frac{7\pi}{6}\right)$ ✓✓ of $\frac{1}{2}\text{cis}\left(-\frac{5\pi}{6}\right)$ $\left(\frac{-\sqrt{3}+i}{2-2\sqrt{3}i}\right)^3 = \frac{1}{8}\text{cis}\frac{7\pi}{2}$ ✓✓ $= 0 - \frac{1}{8}i$ ✓✓	1: $\frac{1}{2}$ 1: hoek/ angle $\frac{7\pi}{6} / -\frac{5\pi}{6}$ 1: hoek/ angle $\frac{7\pi}{2}$ 2: Anwoord/ Answer <b>[9]</b>
3.2 (a)	$\begin{pmatrix} 2 & 1 & 1 \\ 1 & a & -1 \\ 4 & a & 2 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ 5 \\ 1 \end{pmatrix}$ ✓✓	2: Reg geskryf/ <i>Written correctly</i>  <b>[2]</b>
(b) (i)	$\begin{vmatrix} 2 & 1 & 1 \\ 1 & a & -1 \\ 4 & a & 2 \end{vmatrix} = 2(2a + a) - 1(2 + 4) + 1(a - 4a)$ ✓ $= 6a - 6 - 3a = 3a - 6$ ✓	1: Bereken/ <i>Calculate</i> 1: Anwoord/ <i>Answer</i>  <b>[2]</b>
(ii)	$(A_y) = \begin{pmatrix} 2 & 0 & 1 \\ 1 & 5 & -1 \\ 4 & 1 & 2 \end{pmatrix}$ ✓	1: Matriks/ <i>Matrix</i>  <b>[1]</b>
(iii)	$y = \frac{ A_y }{ A }$ ✓ $1 = \frac{3}{3a-6}$ $a = 3$ ✓	1: Toon/ <i>Show Cramer</i> 1: Anwoord/ <i>Answer</i>  <b>[2]</b>
3.3 (a)	$x = \sin\left(y - \frac{\pi}{6}\right) + \frac{1}{2}$ ✓ $\text{bgsin}\left(x - \frac{1}{2}\right) = y - \frac{\pi}{6} / \arcsin\left(x - \frac{1}{2}\right) = y - \frac{\pi}{6}$ ✓ $f^{-1}(x) = \text{bgsin}\left(x - \frac{1}{2}\right) + \frac{\pi}{6} / \arcsin\left(x - \frac{1}{2}\right) + \frac{\pi}{6}$ ✓	1: Ruile <i>x</i> en <i>y</i> / <i>Swop x and y</i> 1: bgsin/ <i>arcsin</i> 1: Anwoord/ <i>Answer</i>  <b>[3]</b>
(b)	$y \in \left[-\frac{1}{3}\pi ; \frac{2}{3}\pi\right]$ ✓✓	2: Elke waard/ <i>Each value</i>  <b>[2]</b>

**VRAAG/ QUESTION 4 [20 PUNTE/ MARKS]**

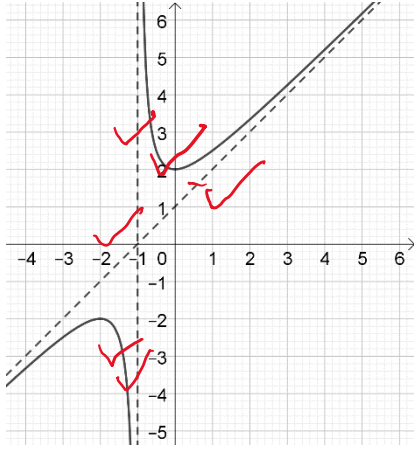
4.1 (a)	$\begin{vmatrix} i & j & k \\ 2 & y & -1 \\ 0 & -2 & 5 \end{vmatrix} = \checkmark$ $i(5y - 2) - j(10) + k(-4) \checkmark$ Dus/ Thus $5y - 2 = 18 \checkmark$ $y = 4 \checkmark$	1: Determinant 1: Brei uit/ <i>Expand</i> 1: Vgl/ <i>Eq</i> 1: Anwoord/ <i>Answer</i> <b>[4]</b>
(b) (i)	Kruisproduk/ <i>Cross product</i> : $18i - 10j - 4k \checkmark$ Oppervl/ <i>Area</i> = $\sqrt{18^2 + 10^2 + 4^2} \checkmark$ = $\sqrt{440}$ of/ or $20,98 \checkmark$	1: Kruisproduk/ <i>Cross product</i> 1: Vervang/ <i>Substitute</i> 1: Anwoord/ <i>Ans</i> <b>[3]</b>
(ii)	$\theta = \text{bgcos} \frac{\mathbf{a} \cdot \mathbf{b}}{ \mathbf{a}  \cdot  \mathbf{b} } / \theta = \arccos \frac{\mathbf{a} \cdot \mathbf{b}}{ \mathbf{a}  \cdot  \mathbf{b} } \checkmark$ $\mathbf{a} \cdot \mathbf{b} = 0 - 8 - 5 = -13 \checkmark$ $ \mathbf{a}  = \sqrt{2^2 + 4^2 + (-1)^2} = \sqrt{21} \checkmark$ $ \mathbf{b}  = \sqrt{0^2 + (-2)^2 + 5^2} = \sqrt{29} \checkmark$ $\theta = \text{bgcos} \frac{-13}{\sqrt{21} \cdot \sqrt{29}} / \arccos \frac{-13}{\sqrt{21} \cdot \sqrt{29}} \checkmark = 2,13 \checkmark$	1: Verander formule/ <i>Change formula</i> 1: Puntproduk/ <i>Point product</i> 1: Grootte/ <i>Size a</i> 1: Grootte/ <i>Size b</i> 1: Vervang/ <i>Substitute</i> 1: Anwoord/ <i>Answer</i> <b>[6]</b>
4.2 (a)	$= \frac{1}{3} \pi \checkmark$	1: $\frac{\pi}{3}$ <b>[1]</b>
(b)	Oppervl sektor/ <i>Area sector</i> $OAC = \frac{1}{2} \cdot \frac{\pi}{3} \cdot 100 \checkmark = \frac{50\pi}{3} = 52,36 \checkmark$	1: Formule reg/ <i>Formula correct</i> 1: Anwoord/ <i>Answer</i> <b>[2]</b>
(c)	$BC = 10 \cos \frac{\pi}{6} = 5\sqrt{3} \checkmark$ Oppv./ <i>Area</i> $\triangle BCO = \frac{1}{2} \cdot 5\sqrt{3} \cdot 10 \sin \frac{\pi}{6} \checkmark = \frac{25\sqrt{3}}{2} \checkmark$ of $\frac{1}{2} \cdot 5 \cdot 10 \sin \frac{\pi}{3}$ Oppv./ <i>Area</i> $BAC = \frac{50\pi}{3} - \frac{25\sqrt{3}}{2} \checkmark$ = 30,71	1: BC 1: Oppv. driehoek/ <i>Area triangle BCO</i> 1: Ant Opp. 1: Anwoord/ <i>Answer</i> <b>[4]</b>

<p>5.1</p>	<p><math>n = 6</math> ✓  <math>\binom{6}{r} (2x)^{6-r} \left(\frac{k}{x^2}\right)^r</math> ✓                  Dus/ Thus <math>6-r - 2r = 0, r = 2</math> ✓  <math>= \binom{6}{2} (2x)^4 \left(\frac{k}{x^2}\right)^2 = 240k^2</math> ✓  <math>240k^2 = 2160</math> ✓  <math>k^2 = 9, k = \pm 3</math> ✓</p>	<p>1: <math>n</math>                  1: Formule/ Formula                  1: <math>r</math>                  1: Stel gelyk/ Set equal                  1: Stel gelyk aan 540/ Equals 540                  1: Vereenvoudig/ Simplify                  1: Anwoord/ Answer  <b>[6]</b></p>
<p>5.2 (a)</p>	 <p>Aaneenlopend by 1/ Continuous at 1 ✓                  Knak of sny by 1 Saliënt punt of intercept at 1 ✓                  Enige twee grafieke wat mekaar sny met hoek <math>x = 1</math>.                  Any two graphs that intersec at <math>x = 1</math></p>	<p>1: Aaneenlopend by 1/ Continuous at 1                  1: Knakpunt by 1/ Saliënt point at 1  <b>[2]</b></p>
<p>(b)</p>	 <p>Oop kol by 1/ Open dot at 1 ✓                  Ander punt by 1/ Other point at 1 ✓</p>	<p>1: Oop kol by 1/ Open dot at 1                  1: Ander punt by 1/ Other point at 1  <b>[2]</b></p>
<p>5.3</p>	<p>Stel/ Set <math>n = 1</math>: LK/ LHS = 0 RK/ RHS = 0, ∴ Die bewering is waar as/ The statement is true for <math>n = 1</math> ✓                  Aanvaar die bewering is waar vir <math>n = k, k \in \mathbb{N}</math> ✓</p> $\sum_{r=1}^k r(r-1) = \frac{k(k^2-1)}{3} \quad \checkmark$ <p>Beskou nou <math>n = k + 1</math>:  <math>LK = \frac{k(k^2-1)}{3} + (k+1)k</math> ✓  <math>= \frac{k^3 - k + 3k^2 + 3k}{3}</math>  <math>= \frac{k^3 + 3k^2 + 2k}{3}</math> ✓  <math>RK = \frac{(k+1)((k+1)^2 - 1)}{3}</math> ✓  <math>= \frac{(k+1)(k^2 + 2k + 1 - 1)}{3}</math> ✓  <math>= \frac{k^3 + 3k^2 + 2k}{3} = LK</math></p> <p>Volgens die beginsel van wiskundige induksie is die bewering dus waar vir alle <math>n \in \mathbb{N}</math> ✓</p> <p>Alternatief  <math>LK = \frac{k(k+1)}{3} \left( \binom{k-1}{3} + 1 \right) = \frac{1}{3} k(k+1)(k+2)</math></p>	<p>1: Bewys <math>n = 1</math>/ Prove <math>n = 1</math>                  1: Aanvaar/ Accept                  1: <math>n = k</math>                  1: Vervang/ Substitute                  RK/ RHS <math>k</math>                  1: <math>(k+1)</math>'de term <math>(k+1)</math>th term                  1: Vereenoudig LK Simplify LHS                  1: Rk Vervang/ Substitute                  2: Vereenvoudig RK/ Simplify RHS                  1: storie/ Story  <b>[10]</b></p>

## VRAAG/ QUESTION 6 [24 PUNTE/ MARKS]

<p>6.1</p>	$\Delta x_i = \frac{2}{n} \checkmark ; x_i = 1 + \frac{2}{n} \cdot i \checkmark$ $f(x_i) = 2\left(1 + \frac{2}{n} \cdot i\right)^2 \checkmark = 2 + \frac{8}{n}i + \frac{8}{n^2}i^2 \checkmark$ $\sum_{i=1}^n \left(2 + \frac{8}{n}i + \frac{8}{n^2}i^2\right) = \sum_{i=1}^n 2 \checkmark + \frac{8}{n} \sum_{i=1}^n i + \frac{8}{n^2} \sum_{i=1}^n i^2$ $= 2n \checkmark + \frac{8}{n} \left(\frac{n^2}{2} + \frac{n}{2}\right) \checkmark + \frac{8}{n^2} \left(\frac{n^3}{3} + \frac{n^2}{2} + \frac{n}{6}\right) \checkmark$ $= 2n + 4n + 4 + \frac{8n}{3} + 4 + \frac{4}{3n} \checkmark$ $= \frac{26}{3}n + 8 + \frac{4}{3n}$ <p><math>\int_1^3 2x^2 dx = \text{basis} \times \text{hoogte}</math></p> $= \frac{2}{n} \times \left(\frac{26}{3}n + 8 + \frac{4}{3n}\right) = \frac{52}{3} + \frac{16}{n} + \frac{8}{3n^2} \checkmark$ $\int_1^3 x^2 dx = \lim_{n \rightarrow \infty} \left(\frac{52}{3} + \frac{16}{n} + \frac{8}{3n^2}\right) = \frac{52}{3} \checkmark$ <p>Dus <math>\int_1^3 (2x^2) dx = \frac{52}{3}</math></p> <p style="text-align: center;"><b>OF</b></p> $\Delta x_i = \frac{2}{n} \checkmark ; x_i = 1 + \frac{2}{n} \cdot i \checkmark$ $f(x_i) = 2\left(1 + \frac{2}{n} \cdot i\right)^2 \checkmark = 2\left(1 + \frac{4}{n}i + \frac{4}{n^2}i^2\right) \checkmark$ $\Delta x_i \times f(x_i) = \frac{4}{n} + \frac{16}{n^2}i + \frac{16}{n^3}i^2 \checkmark$ $\sum_{i=1}^n \left(\frac{4}{n} + \frac{16}{n^2}i + \frac{16}{n^3}i^2\right) = \frac{16}{n^3} \sum_{i=1}^n i^2 + \frac{16}{n^2} \sum_{i=1}^n i + \frac{4}{n} \sum_{i=1}^n 1 \checkmark$ $= \frac{16}{n^3} \left(\frac{n^3}{3} + \frac{n^2}{2} + \frac{n}{6}\right) \checkmark + \frac{16}{n^2} \left(\frac{n^2}{2} + \frac{n}{2}\right) \checkmark + 4$ $= \frac{52}{3} + \frac{16}{n} + \frac{8}{3n^2} \checkmark$ $\int_1^3 x^2 dx = \lim_{n \rightarrow \infty} \left(\frac{52}{3} + \frac{16}{n} + \frac{8}{3n^2}\right) = \frac{52}{3} \checkmark \text{ Dus } \int_1^3 (2x^2) dx = \frac{52}{3}$	<p>1: <math>\Delta x_i</math>  1: <math>x_i</math>  2: <math>f(x_i)</math>  1: Sigma  1: Vervang/ Substitute <math>i^2</math>  1: Vervang/ Substitute <math>i</math>  1: Vervang/ Substitute 1  1: Vereenvoudig/  Simplify  1: <math>\Delta x_i \times f(x_i)</math>  1: Antwoord/ Answer</p> <p style="text-align: right;"><b>[11]</b></p>
<p>6.2 (a)</p>	<p><math>x = 1 - 5i</math> ook nulpunt <math>\checkmark</math>  <math>x - 1 = \pm 5i \checkmark</math>  <math>x^2 - 2x + 26</math> is 'n faktor. <math>\checkmark</math>  <math>x^4 - 8x^3 + 47x^2 - 174x + 234 = (x^2 - 2x + 26)(x^2 \checkmark - 6x \checkmark + 9 \checkmark)</math>  <math>x = 3 \checkmark</math></p>	<p>1: Ander nulpunt/  Other zero  2: faktor, enige metode/  Factor, any method  3: ander faktor, elke term  Other factor, each term  1: <math>x=3</math></p> <p style="text-align: right;"><b>[7]</b></p>
<p>(b)</p>	<p><math>f'(x) = 4x^3 - 24x^2 + 94x - 174 \checkmark</math>  <math>f''(x) = 12x^2 - 48x + 94 \checkmark</math>  <math>f''(3) = 58 \checkmark</math>  Nee, dit is nie buigpunt nie. <math>\checkmark</math>  <math>f(2) = 24</math> en <math>f(4) = 40</math>. Dus min draaiunt. <math>\checkmark \checkmark</math> (Want <math>f(3) = 0</math>)  OF  <math>f'(2) = -42</math> en <math>f'(4) = 90</math> Dus min draaipunt  OF  <math>f''(3) = 58 &gt; 0</math> dus min draaipunt</p>	<p>1: 1e afgeleide/  1st derivative  1: 2e afgeleide/  2nd derivative  1: 2e afgeleide van 3/  2nd derivative of 3  1: Nie buigpunt/  Not inflection  2: Enigemetode, min draaipunt./  Any method, min tp</p> <p style="text-align: right;"><b>[6]</b></p>

**VRAAG/ QUESTION 7 [17 PUNTE/ MARKS]**

7.1	$y = 2$ ✓	1: Anwoord/ Answer <b>[1]</b>
7.2	Skuins: ✓ $y = x + 1$ ✓ Vertikaal ✓: $x = -1$ ✓	1: Tipe/ Type 1: $y=x+1$ 1: Tipe/ Type $X=-1$ <b>[4]</b>
7.3	$f'(x) = 0$ ✓ $\frac{(2x + 2)(x + 1) - ((x^2 + 2x + 2)(1))}{(x + 1)^2} = 0$ $2x^2 + 4x + 2 - x^2 - 2x - 2 = 0 \quad \text{of} \quad 1 - \frac{1}{(x+1)^2} = 0$ $x^2 + 2x = 0$ ✓ $x = 0$ of $x = -2$ ✓ $y = 2$ of $y = -2$ ✓	1: Afgeleide = 0/ Derivative = 0 2: Differensieer/ Differentiate 1: Vereenvoudig/ Simplify 1: x ant/ ans 1: y ant/ ans <b>[6]</b>
7.4		1: y-afsnit/ intercept 1: Vert asimptoot/ Vert asymptote 1: Skuins asimpt/ Oblique asymptote 2: Draaipunte/ Turning points 1: Vorm/ Form <b>[6]</b>

## VRAAG/ QUESTION 8 [ 21 PUNTE/ MARKS]

8.1 (a)	$f'(x) = 5^x \cdot \ln 5 \cdot \log x \checkmark + \checkmark 5^x \cdot \frac{1}{x \cdot \ln 10} \checkmark$ Nie produkr: 2/3 maks	1: $5^x$ 1: $\log x$ 1: produkreël/ <i>Product rule</i> <b>[3]</b>
(b)	$\sec^2 \checkmark \left( e^{\frac{x}{2}+1} \right) \checkmark \quad e^{\frac{x}{2}+1} \times \checkmark \frac{1}{2} \checkmark$	2: $\sec^2 \left( e^{\frac{x}{2}+1} \right)$ 1: $e^{\frac{x}{2}+1}$ 1: $\frac{1}{2}$ <b>[4]</b>
8.2	$2x \cdot \checkmark \ln y + \frac{x^2}{y} \cdot y' \checkmark + 2 - 5y' \checkmark = 0$ $2x \cdot \ln y + 2 = y' \left( 5 - \frac{x^2}{y} \right) \checkmark$ $y' = \frac{2x \cdot \ln y + 2}{5 - \frac{x^2}{y}} \checkmark$ $(3; 1): m = y' = \frac{2(3) \times \ln 1 + 2}{5 - \frac{9}{1}} = -\frac{1}{2} \checkmark$ OF Vervang/ Substitute $x$ en $y$ dadelik: $\therefore 6 \ln 1 + 9y' + 2 - 5y' = 0$ $4y' = -2 \quad \therefore y' = -\frac{1}{2}$	3: Differensieer/ <i>Differentiate</i> 1: $y'$ alleen/ <i>alone</i> 1: $y'$ 1: Antwoord/ <i>Answer</i> <b>[6]</b>
8.3 (a)	Stel $f(x) = \ln x - 4 + \frac{1}{2}x$ $f(4) = -0,61 \dots \checkmark$ $f(5) = 0,109 \dots \checkmark$ Omdat die funksie kontinu is vir $x > 0$ dus ook vir interval, moet daar nulpunt wees $\checkmark$	1: 4 negatief/ <i>negative</i> 1: 5 positief/ <i>positive</i> 1: rede/ <i>reason</i> <b>[3]</b>
(b)	$f'(x) = \frac{1}{x} + \frac{1}{2} \checkmark$ $x_{n+1} = x_n - \frac{\ln x_n - 4 + \frac{1}{2}x_n}{\frac{1}{x_n} + \frac{1}{2}} \checkmark$ $x \approx 4,8444 \checkmark \checkmark \checkmark$	1: afgeleide/ <i>derivative</i> 1: Newton 2: Antwoord/ <i>Answer</i> 1: 4 des korrek/ <i>correct</i> <b>[5]</b>

## VRAAG/ QUESTION 9 [ 20 PUNTE/ MARKS]

9.1	$\int (\operatorname{cosec}^2 3x - 1 - \sin(2x)) dx$ $= -\frac{\cot 3x}{3} - x + \cos(2x) \cdot \frac{1}{2} + k$	1: Identiteit/ Identity 1: $-\frac{\cot 3x}{3}$ 1: $-x$ 1: $+\cos(2x)$ 1: $\frac{1}{2}$ <b>[5]</b>
9.2	Stel $f(x) = x$ en $g'(x) = e^x$ Dus $f'(x) = 1$ en $g(x) = e^x$ $= xe^x - \int e^x dx$ Dus $xe^x - e^x \Big _0^{lna}$ $= lna \cdot e^{lna} - e^{lna} + 1 =alna - a + 1$	1: f 1: g 1: 1e stap/ 1st step 1: Antwoord integraal / Answer integral 1: Antwoord/ Answer <b>[5]</b>
9.3	$\frac{c}{3} \cdot \ln(1+x^3) + k$ of stel: $u = 1+x^3 \therefore \frac{du}{dx} = 3x^2$ $\frac{c}{3} \int \frac{1}{u} du = \frac{c}{3} \ln u + k$	3: Antwoord/ Answer <b>[3]</b>
9.4	Stel $\frac{-4x^2+2x-102}{(x^2+1)(x-1)} = \frac{Ax+B}{x^2+1} + \frac{C}{x-1}$ $-4x^2 + 2x - 102 = (Ax + B)(x - 1) + C(x^2 + 25)$ Stel $x = 1$ : $-104 = 26C$ , $C = -4$ $x^2$ : $-4 = A + C$ , $A = 0$ Konst: $-102 = -B + 25C$ , $B = 2$ $\int \left( \frac{2}{x^2+25} - \frac{4}{x-1} \right) dx = \frac{2}{25} \int \frac{1}{\left(\frac{x}{5}\right)^2+1} dx - 4 \ln(x-1)$ $= \frac{2}{25} \operatorname{bgtan}\left(\frac{x}{5}\right) \cdot 5 - 4 \ln(x-1) + k$ $= \frac{2}{5} \operatorname{bgtan}\left(\frac{x}{5}\right) - 4 \ln(x-1) + k$	1: C 1: A 1: B 1: Maak integraal reg/ Make integral ready 1: $\operatorname{bgtan}\left(\frac{x}{5}\right) / \operatorname{arctan}\left(\frac{x}{5}\right)$ 1: $\frac{2 \times 5}{25} = \frac{2}{5}$ 1: $-4 \ln(x-1)$ <b>[7]</b>

**VRAAG/ QUESTION 10 [ 19 PUNTE/ MARKS]**

10.1	$\int_0^a \frac{3}{\sqrt{1+4x}} dx = 3 \int_0^a (1+4x)^{-\frac{1}{2}} dx \checkmark$ $= \frac{3}{2} (1+4x)^{\frac{1}{2}} \Big _0^a \checkmark$ $= \frac{3}{2} (\sqrt{1+4a} - 1) \checkmark = 3 \checkmark$ $\sqrt{1+4a} - 1 = 2 \checkmark$ $1+4a = 9 \checkmark$ $a = 2 \checkmark$	1: Eksponent 1: Integreer/ <i>Integrate</i> 1: Vervang/ <i>Substitute</i> 1: Stel = 3/ <i>Set = 3</i> 1: Vereenvoudig/ <i>Simplify</i> 2: Antwoord/ <i>Answer</i> <div style="text-align: right;"><b>[7]</b></div>
10.2	$P(2; 1) \checkmark$ $f'(x) = \frac{-3}{2} (1+4x)^{-\frac{3}{2}} \cdot 4 \checkmark$ $= -6(1+4x)^{-\frac{3}{2}} \checkmark$ $m = -\frac{2}{9} \checkmark$ $\therefore m_{\perp} = \frac{9}{2} \checkmark$ $y = \frac{9x}{2} - 8$ $y\text{-afsnit is } -8 \checkmark$	1: P 2: Differensieer/ <i>Differentiate</i> 1: m grafiek/ <i>graph</i> 1: m normaal/ <i>normal</i> 1: Antwoord/ <i>Answer</i> <div style="text-align: right;"><b>[6]</b></div>
10.3	$V = 9\pi \int_1^2 \left(\frac{1}{1+4x}\right) dx \checkmark \checkmark$ $= \frac{9\pi}{4} \checkmark \ln(1+4x) \checkmark \Big _1^2$ $= \frac{9\pi}{4} (\ln 9 - \ln 5) = \frac{9\pi}{4} \left(\ln \frac{9}{5}\right) \checkmark$ $\text{Dus } \theta = \frac{9\pi}{4} \text{ en } \beta = \frac{9}{5} \checkmark$	1: Vervang/ <i>Substitute</i> 1: Funksie kwadreeer/ <i>Square function</i> 2: Integreer/ <i>Integrate</i> 1: $\theta = \frac{9\pi}{4}$ 1: $\beta = \frac{9}{5}$ <div style="text-align: right;"><b>[6]</b></div>