basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NASIONALE SENIOR SERTIFIKAAT

GRAAD 11

TEGNIESE WISKUNDE V1

MODEL 2017

MEMORANDUM

PUNTE: 150

Hierdie memorandum bestaan uit 12 bladsye.

Kopiereg voorbehou

LET WEL:

- Indien 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE probeerslag na.
- Indien 'n antwoord deurgehaal is en dit is nie weer gedoen nie, sien die deurgehaalde antwoord na.
- Konstante akkuraatheid is op ALLE aspekte van die memorandum van toepassing.
- Om antwoorde/waardes aan te neem om probleme op te los, is onaanvaarbaar.

VRAAG 1

1.1.1	$\left(\frac{1}{27}\right)^{\frac{1}{3}}$ $=\left(3^{-3}\right)^{\frac{1}{3}}$ or $\left(\frac{1}{3}\right)^{3\left(\frac{1}{3}\right)}$ $=3^{-1}$ $=\frac{1}{3}$	✓$\left(3^{-3}\right)^{\frac{1}{3}}$ or $\left(\frac{1}{3}\right)^{3\left(\frac{1}{3}\right)}$ ✓antw. (2)
1.1.2	$\frac{\sqrt{20}-\sqrt[3]{8}}{\sqrt{5}-1}$ $=\frac{\sqrt{5\times 4}-\left(2^3\right)^{\frac{1}{3}}}{\sqrt{5}-1}$ $=\frac{2\sqrt{5}-2}{\sqrt{5}-1}$ $=\frac{2(\sqrt{5}-1)}{\sqrt{5}-1}$ $=2$ ✓	✓$\sqrt{5\times 4}$ ✓$(2^3)^{\frac{1}{3}}$ ✓gemeenskaplike faktor ✓antw. (4)
1.1.3	$\frac{\sqrt[4]{16x^8}}{\sqrt{81x^2}-\sqrt[3]{64x^3}}$ $=\frac{\left(2^4\right)^{\frac{1}{4}}\cdot\left(x^8\right)^{\frac{1}{4}}}{\left(9^2\right)^{\frac{1}{2}}\cdot\left(x^2\right)^{\frac{1}{2}}-\left(4^3\right)^{\frac{1}{3}}\cdot\left(x^3\right)^{\frac{1}{3}}}$ $=\frac{2x^2}{9x-4x}$ $=\frac{2x^2}{5x}$ $=\frac{2x}{5}$	✓$\left(2^4\right)^{\frac{1}{4}}\cdot\left(x^8\right)^{\frac{1}{4}}$ ✓$\left(9^2\right)^{\frac{1}{2}}\cdot\left(x^2\right)^{\frac{1}{2}}$ ✓$\left(4^3\right)^{\frac{1}{3}}\cdot\left(x^3\right)^{\frac{1}{3}}$ ✓vereenvoudig ✓antw. (5)

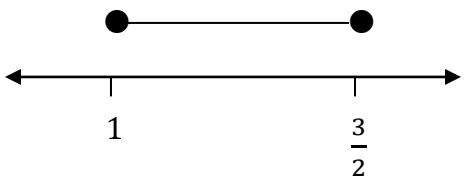
1.1.4	$\frac{6^{x+1}.9^{x-1}}{2^{x+1}.27^{x}}$ $=\frac{(3.2)^{x+1}.(3^2)^{x-1}}{2^{x+1}.(3^3)^{x}}$ $=\frac{3^{x+1}.2^{x+1}.3^{2x-2}}{2^{x+1}.3^{3x}}$ $=3^{x+1+2x-2-3x}.2^{x+1-x-1}$ $=3^{-1}.2^{0}$ $=\frac{1}{3}$	✓ priemgetalle ✓vereenvoudig ✓wette ✓antw. (4)
1.1.5	$\frac{3^{2x}-7\cdot 3^{x}+12}{2\cdot 3^{x}-8}$ $=\frac{(3^{x}-4)(3^{x}-3)}{2(3^{x}-4)}$ $=\frac{3^{x}-3}{2}$	✓Faktorisering ✓gemeenskaplike faktor ✓antw. (3)
1.1.6	$\log_{\frac{1}{2}} 4+\log_{p} p-\log_{10} 100$ $=\frac{\log 2^{2}}{\log 2^{-1}}+\frac{\log p}{\log p}-\frac{\log 10^{2}}{\log 10}$ $=\frac{2\log 2}{-\log 2}+1-\frac{2\log 10}{\log 10}$ $=-2+1-2$ $=-3$	✓ $\frac{2\log 2}{-\log 2}$ ✓1 ✓ $\frac{2\log 10}{\log 10}$ ✓antw (4)

1.2	$LHS = \dfrac{\log 3^{\frac{3}{2}} + \log 2^{\frac{3}{2}} - \log 5^{\frac{3}{2}}}{\log \frac{6}{5}}$	✓wortels en eksponente
	$= \dfrac{\frac{3}{2}\log 3 + \frac{3}{2}\log 2 - \frac{3}{2}\log 5}{\log \frac{6}{5}}$	✓magreël ✓delingreël
	$= \dfrac{\frac{3}{2}(\log 3 + \log 2 - \log 5)}{\log \frac{6}{5}}$	✓gemeenskaplike faktor ✓vermenigv/delingreël
	$= \dfrac{\frac{3}{2}\log\left(\frac{3\times 2}{5}\right)}{\log \frac{6}{5}}$	
	$= \dfrac{\frac{3}{2}\log \frac{6}{5}}{\log \frac{6}{5}}$	✓vereenvoudiging (6)
	$= \frac{3}{2}$	**[28]**

VRAAG 2

2.1.1	$3^x + 3^{x-1} = \frac{4}{9}$ $3^x\left(1+\frac{1}{3}\right) = \frac{4}{9}$ $3^x\left(\frac{4}{3}\right) = \frac{4}{9}$ $3^x = \frac{1}{3}$ $3^x = 3^{-1}$ $\therefore x = -1$	✓gemeensk. faktor ✓$\left(\frac{4}{3}\right)$ ✓$\frac{1}{3}$ ✓3^{-1} ✓antw. (5)
2.1.2	$2^x = 5$ $\log 2^x = \log 5$ $x\log 2 = \log 5$ $x = \frac{\log 5}{\log 2}$ $x = 2.32$	✓$\log 2^x = \log 5$ ✓$x = \frac{\log 5}{\log 2}$ ✓antw. (3)
2.1.3	$\log_4(x-6) + \log_4 x = 2$ $\log_4 x(x-6) = 2$ $x^2 - 6x = 4^2$ $x^2 - 6x - 16 = 0$ $(x-8)(x+2) = 0$ $x = 8$ or $x = 2$ $\therefore x = 8$ or $x \neq -2$	✓$x(x-6)$ ✓$x^2 - 6x = 4^2$ ✓standaard vorm ✓faktorisering ✓waardes ✓beperking (6)
2.2.1	$i(R + \frac{nr}{m}) = nE$ $R + \frac{nr}{m} = \frac{nE}{i}$ $R = \frac{nE}{i} - \frac{nr}{m}$	✓kruis-vermenigv. ✓Deel deur i ✓antw. (3)
2.2.2	$R = \frac{nE}{i} - \frac{nr}{m}$ $R = \frac{5.6\times 2.4}{2.3} - \frac{5.6\times 0.4}{2}$ $= 4.72$	✓Vervanging ✓antw. (2)
2.3	$\log 15 = \log(5\times 3)$ $= \log\left(\frac{10}{2}\times 3\right)$ $= \log 10 - \log 2 + \log 3 = 1 - a + b$	✓$\log\left(\frac{10}{2}\times 3\right)$ ✓reëls ✓antw. (3) **[22]**

VRAAG 3

3.1.1	$g(x) = 0$ $x^2 - 3x = 0$ $x(x-3) = 0$ $x = 0$ or $x = 3$	✓standaardvorm ✓gemeenskaplike faktor ✓albei waardes
3.1.2	$g(x) = 5$ $x^2 - 3x = 5$ $x^2 - 3x - 5 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-5)}}{2(1)}$ $x = \frac{3 \pm \sqrt{29}}{2}$ $\therefore x = 4.19$ or $x = -1.19$	✓standaardvorm ✓formule ✓vervanging ✓vereenvoudiging ✓albei waardes (5)
3.2	$\frac{2x-3}{x-1} = \frac{x+1}{3}$ $(x-1)(x+1) = 3(2x-3)$ $x^2 - 1 = 6x - 9$ $x^2 - 6x + 8 = 0$ $(x-4)(x-2) = 0$ $x = 4$ or $x = 2$	✓ $(x-1)(x+1) = 3(2x-3)$ ✓standaardvorm ✓faktorisering ✓albei waardes (4)
3.3	$(2x-3)(x-1) \leq 0$ Kritieke waardes: $\frac{3}{2}$ and 1  $1 \leq x \leq \frac{3}{2}$	✓kritieke waardes ✓✓voorstelling ✓eindpunte ✓notasie (5)

3.4	$y - x - 3 = 0$ ……(1) $x^2 + 4x + y = -1$ ……..(2) Vanaf (1) $y = x + 3$ Verv. y in (2) $x^2 + 4x + x + 3 = -1$ $x^2 + 5x + 4 = 0$ $(x + 4)(x + 1) = 0$ $\therefore x = -4$ or $x = -1$ Verv. x in (1) $y = -4 + 3$ or $y = -1 + 3$ $\therefore y = -1$ or $y = 2$ **OF** Vanaf (1) $x = y - 3$ Verv. x in (2) $(y - 3)^2 + 4(y - 3) + y + 3 = -1$ $y^2 - y - 2 = 0$ $(y - 2)(y + 1) = 0$ $\therefore y = 2$ or $y = -1$ Verv. y in (1) $x = 2 - 3$ or $x = -1 - 3$ $\therefore x = -1$ or $x = -4$	✓ $y = x + 3$ ✓vervanging ✓standaardvorm ✓faktore ✓albei waardes van x ✓✓albei waardes van y (7) **OF** ✓ $x = y - 3$ ✓vervanging ✓standaardvorm ✓faktore ✓albei waardes van y ✓✓albei waardes van x (7)
3.5	Laat die getal ure van die verwarmer x wees en die elektriese motorse se ure y wees. Then $3x + 4y = 44$ ……(1) en $2x + y = 21$ ……(2) $4(2x + y) = 4(21)$ $8x + 4y = 84$ $3x + 4y = 44$ $5x = 40$ $\therefore x = 8$ $y = 21 - 2(8)$ $\therefore y = 5$ $\therefore$ energie verbr. van verwarmer is $8\,kJ/h$ en elektriese. motor $5\,kJ/h$. **OF**	✓stel die y waardes gelyk ✓metode ✓ $5x = 40$ ✓waarde van x ✓vervanging ✓waarde van y (6) **OF**

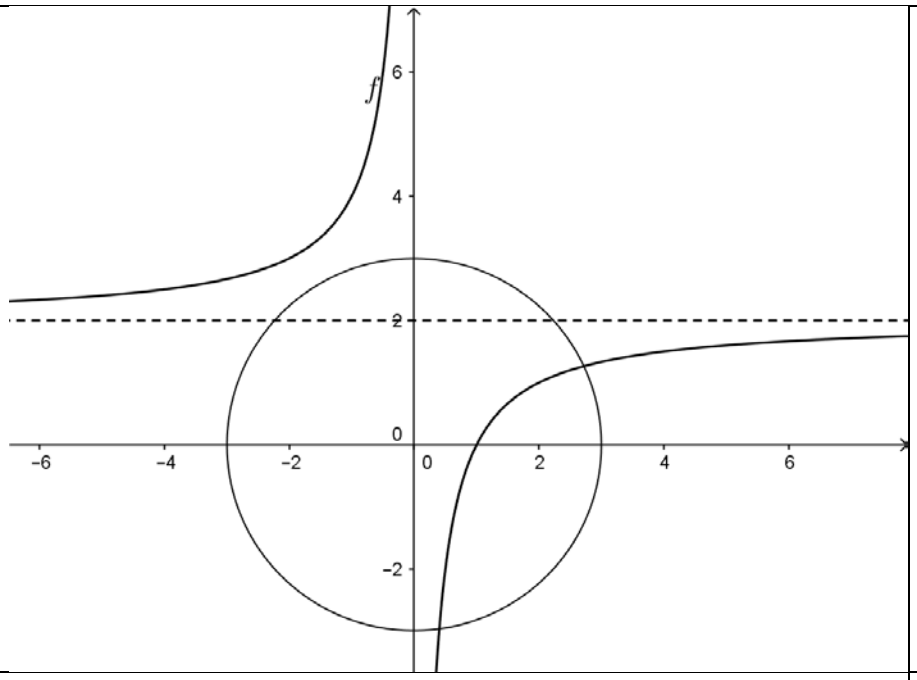
	$3x+4y=44$ ……(1) en $2x+y=21$……(2) Vanaf (2) $y=21-2x$ vervang y in (1) $3x+4(21-2x)=44$ $3x+84-8x=44$ $5x=40$ $\therefore x=8$ Verv.. x in (2) $2(8)+y=21$ $\therefore y=5$	✓ $y=21-2x$ ✓vervanging ✓ $5x=40$ ✓waarde van x ✓subst. ✓waarde van y (6) **[30]**

VRAAG 4

4.1	$\Delta=16$ Die wortels is reël, rasionaal en ongelyk	✓reële ✓rasionale ✓ongelyk (3)
4.2	$\Delta=b^2-4ac$ $\Delta=(-2)^2-4(-4)(1)$ $\therefore \Delta=20$ Die wortels is reël, irrasionaal en ongelyk	✓delta ✓vervanging ✓waardes ✓reël, irrasionaal ✓ongelyk (5) **[8]**

VRAAG 5

5.1	$x=0$ en $y=2$	✓ $x=0$ ✓ $y=2$ (2)
5.2	y-afsnit is ongedefinieerd, $x\neq 0$ x-afsnit, $f(x)=0$ $0=-\frac{2}{x}+2$ $2x=2$ $x=1$	✓ongedefinieerd ✓ $f(x)=0$ ✓ $2x=2$ ✓waarde van x (4)
5.3	$r^2=9$ $r=3$	✓ $r^2=9$ ✓waarde van r (2)

5.4		✓assimptote ✓ snypunte van f ✓ vorm van f ✓ snypunte van sirkel ✓ vorm van g (5)
5.5	$y = -x + c$ $2 = -(0) + c$ $\therefore c = 2$ $\therefore y = -x + 2$	✓-1 ✓vervanging ✓vergelyking (3)
5.6	$y \in R$, $y \neq 2$	✓ $y \in R$ ✓beperking (2)
5.7	$-3 \leq x \leq 3$ or $x \in [-3,3]$	✓domein (1) **[19]**

VRAAG 6

6.1	$q = -2$ $g(x) = a \cdot 2^x - 2$ $0 = a \cdot 2^1 - 2$ $2a = 2$ $\therefore a = 1$	✓waarde van q ✓ $0 = a \cdot 2^1 - 2$ ✓ $2a = 2$ ✓ $\therefore a = 1$ (4)
6.2	$x > 1$	✓ $x > 1$ (1)
6.3	$x > 1$	✓ $x > 1$ (1) **[6]**

VRAAG 7

7.1	$r = 3$ $p(x) = \sqrt{r^2 - x^2}$ $p(x) = \sqrt{9 - x^2}$	✓r ✓formule ✓vergelyking (3)
7.2	$x / -3 \leq x \leq 3$	✓eindpunte ✓notasie (2)
7.3	$0 = -2x + 3$ $x = \frac{3}{2}$	✓ $h = 0$ ✓ waarde van x (2)
7.4.1	$x = 0$	✓ $x = 0$ (1)
7.4.2	$\frac{3}{2} \leq x \leq 3$	✓eindpunte ✓notasie (2) **[10]**

VRAAG 8

8.1	x-afsnit, $f(x) = 0$ $-2x^2 - 3x + 2 = 0$ $2x^2 + 3x - 2 = 0$ $(2x - 1)(x + 2) = 0$ $\therefore x = \frac{1}{2}$ or $x = -2$ $AB = 2\frac{1}{2}$ eenhede	✓ $f(x) = 0$ ✓standaardvorm ✓faktore ✓waarde van x ✓lengte (5)
8.2	$C(0;2)$	✓0 ✓ 2 (2)

8.3	$x = \dfrac{-2+\frac{1}{2}}{2}$ $x = \dfrac{-3}{4}$ $f\left(\dfrac{-3}{4}\right) = -2\left(\dfrac{-3}{4}\right)^2 - 3\left(\dfrac{-3}{4}\right) + 2$ $= \dfrac{25}{8}$ $\text{D}\left(\dfrac{-3}{4};\dfrac{25}{8}\right)$	✓ metode ✓waarde van x ✓vervanging ✓koördinate van D (4)
	OF	**OF**
	$x = \dfrac{-b}{2a}$ $x = \dfrac{-(-3)}{2(-2)}$ $x = -\dfrac{3}{4}$ $f\left(\dfrac{-3}{4}\right) = -2\left(\dfrac{-3}{4}\right)^2 - 3\left(\dfrac{-3}{4}\right) + 2$ $= \dfrac{25}{8}$ $\text{D}\left(\dfrac{-3}{4};\dfrac{25}{8}\right)$	✓ metode ✓waarde van x ✓vervanging ✓koördinate van D (4)
8.4	Maks = $\dfrac{25}{8}$	□ $\dfrac{25}{8}$ (1) **[12]**

QUESTION 9

9.1	$i_{eff} = \left(1+\frac{i_{nom}}{n}\right)^n - 1$ $i_{eff} = \left(1+\frac{0.106}{4}\right)^4 - 1$ $\therefore i_{eff} = 0.1102884317$ $\therefore$ rente koers is 11.03%	✓formule ✓vervanging ✓vereenvoudiging ✓koers (4)
9.2.1	R 1000	✓antw. (1)
9.2.2	Vermindering. Die grafiek verlaag of verminder of neem af.	✓ waardevermindering ✓rede (2)
9.2.3	$A = P(1-i)^n$ $i = 1-\sqrt[n]{\frac{A}{P}}$ $i = 1-\sqrt[10]{\frac{196.87}{1000}}$ $\therefore i = 0.1500019016$ $\therefore$ rente koers is 15%	✓formule ✓i , onderwerp ✓vervanging ✓ koers (4)
9.3	$A = P(1+i)^n \cdot (1+i)^n$ $A = 5200(1+0.094)^4 \cdot (1+0.02)^8$ $\therefore A = R8727.18$	✓formule ✓✓vervanging ✓antw. (4) **[15]**

		TOTaAL: 150

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