NASIONALE SENIOR SERTIFIKAAT-EKSAMEN
MEI 2022

WISKUNDE: VRAESTEL I

NASIENRIGLYNE

Tyd: 3 uur 150 punte

Hierdie nasienriglyne is opgestel vir gebruik deur eksaminators en hulpeksaminators van wie verwag word om almal 'n standaardiseringsvergadering by te woon om te verseker dat die riglyne konsekwent vertolk en toegepas word by die nasien van kandidate se skrifte.

Die IEB sal geen bespreking of korrespondensie oor enige nasienriglyne voer nie. Ons erken dat daar verskillende standpunte oor sommige aangeleenthede van beklemtoning of detail in die riglyne kan wees. Ons erken ook dat daar sonder die voordeel van die bywoning van 'n standaardiseringsvergadering verskillende vertolkings van die toepassing van die nasienriglyne kan wees.

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LET WEL:

- Indien 'n leerder 'n vraag meer as een keer beantwoord, sien slegs die EERSTE poging na.
- Deurlopende akkuraatheid (ca) geld vir alle aspekte van die nasienmemorandum.

AFDELING A

VRAAG 1

(a)	$2x-7=4$ $x=\frac{11}{2}$	✓m kwadrering ✓ca $x=\frac{11}{2}$ (2)
(b)	$3x-1=\pm(x+1)$ $3x-1=x+1$ of $3x-1=-x-1$ $x=1$ of $x=0$ **OF** $9x^2-6x+1=x^2+2x+1$ $8x^2-8x=0$ $8x(x-1)=0$ $x=0$ of $x=1$	✓a ✓m $3x-1=\pm(x+1)$ ✓ca $x=1$ ✓ca $x=0$ (4) Uitvermenigvuldiging ✓a✓m ✓ca $x=1$ ✓ca $x=0$
(c)	$7^{2x}=7^{x-2}$ $\therefore 2x=x-2$ $\therefore x=-2$ **Alternatief:** $7^{2x}-7^{x-2}=0$ $7^x.7^x-7^x.7^{-2}=0$ $7^x\left(7^x-\frac{1}{7^2}\right)=0$ $\therefore 7^x=0$ NVT of $7^x=7^{-2}$ $\therefore x=-2$	✓a $7^{2x}=7^{x-2}$ ✓ca $\therefore 2x=x-2$ ✓ca $\therefore x=-2$ ✓a $7^{2x}=7^{x-2}$ ✓ca $7^x\left(7^x-\frac{1}{7^2}\right)=0$ ✓ca $\therefore x=-2$ (3)
(d)	$\log_2(x^2-3x+10)=3$ $x^2-3x+10=2^3$ $x^2-3x+2=0$ $(x-2)(x-1)=0$ $x=2$ of $x=1$	✓a $x^2-3x+10=2^3$ ✓ca $(x-2)(x-1)=0$ ✓ca $x=2$ ✓ca $x=1$ (4)
(e)	$2x^2+3px+p^2=0$ $(2x+p)(x+p)=0$ $x=-\frac{1}{2}p$ of $x=-p$	✓m $(2x+p)(x+p)=0$ ✓a $x=-\frac{1}{2}p$ ✓a $x=-p$ (3) **[16]**

VRAAG 2

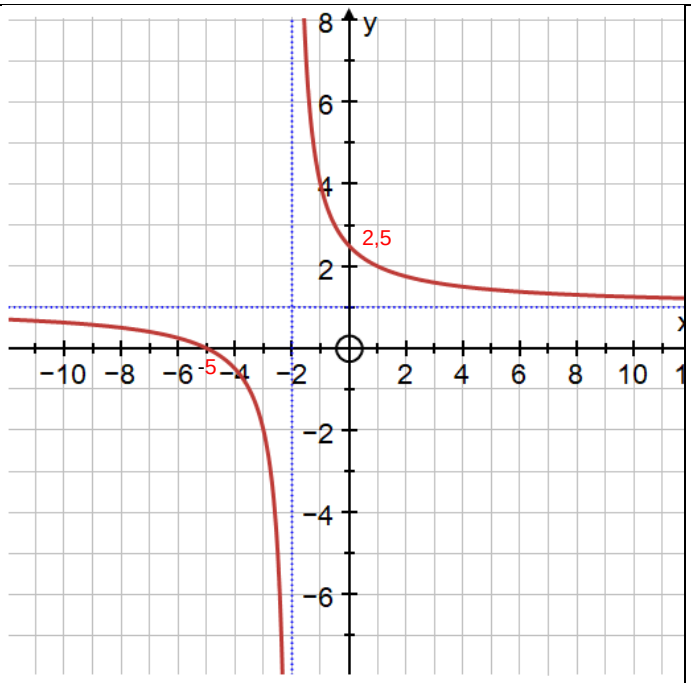
(a)(1)	$T_1 = 7$; $T_2 = 1$	✓a $T_1 = 7$ ✓ca $T_2 = 1$ (2)
(a)(2)	$S_\infty = \dfrac{7}{1-\frac{1}{7}}$ $S_\infty = \dfrac{49}{6}$	✓ca $S_\infty = \dfrac{7}{1-\frac{1}{7}}$ ✓ca $S_\infty = \dfrac{49}{6}$ (2)
(b)	2 5 6 5 2 Ry 3 1 –1 –3 Eerste verskil –2 –2 –2 Konstante tweede verskil $2a = -2 \quad \therefore a = -1$ $3a + b = 3 \quad \therefore \quad b = 6$ $a + b + c = 2 \quad \therefore \quad c = -3$ $T_n = -n^2 + 6n - 3$	✓a Eerste verskil ✓a Konstante tweede verskil ✓ca $a = -1$ ✓ca $b = 6$ ✓ca $c = -3$ (5) **[9]**

VRAAG 3

(a)	$P = x\left[\frac{1-(1+i)^{-n}}{i}\right]$ $1\,800\,000 = x\left[\frac{1-\left(1+\frac{9,25}{1200}\right)^{-30\times12}}{\frac{9,25}{1200}}\right]$ $x = R14\,808,16$	✓m Gebruik van korrekte formule ✓a $\left(1+\frac{9,25}{1200}\right)$ ✓a $n = 360$ in Pv-formule ✓ca $x = R14\,808,16$ (4)
(b)	OB = A – F $A = 1\,800\,000\left(1+\frac{9,25}{1200}\right)^{144}$ $A = 5\,438\,647,444$ $F = 14\,808,15766\left[\frac{\left(1+\frac{9,25}{1200}\right)^{144}-1}{\frac{9,25}{1200}}\right]$ $F = 3\,883\,363,245$ OB $= 1555\,284,20$ **OF** OB $= 14\,808,16\frac{1-\left(1+\frac{9,25}{1\,200}\right)^{-216}}{\frac{9,25}{1\,200}}$ $= R1\,555\,284,45$	✓a rentekoers ✓a vir n ✓a Korrekte formule ✓ca Vervanging ✓ca antwoord (5) ✓a rentekoers ✓a vir n ✓a Korrekte formule ✓ca Vervanging ✓ca antwoord **[9]**

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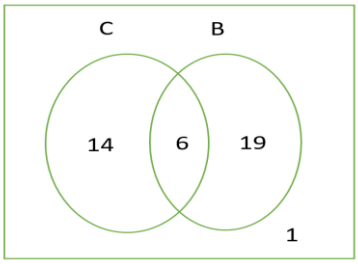
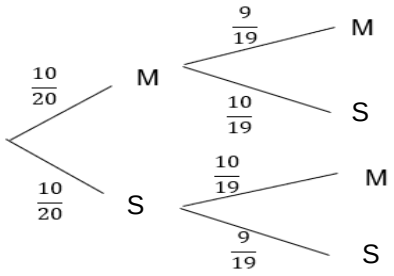
VRAAG 4

(a)(1)		✓ Vorm ✓ Vertikale asimptoot ✓ Horisontale asimptoot ✓ *x*-afsnit ✓ *y*-afsnit (5)
(a)(2)	$\mathbb{R}-\{-2\}$ **OF** $(-\infty\,;-2)\cup(-2\,;\infty)$ **OF** $\{x : x<-2 \text{ of } x>-2\}$	(1)
(b)(1)	$y=3^x$ Vir inverse: laat $x=3^y$ $g(x)=\log_3 x$	✓^{m} $x=3^y$ ✓^{a} $g(x)=\log_3 x$ (2)
(b)(2)(i)	$x\in R$	✓^{a} $x\in R$ (1)
(b)(2)(ii)	$\therefore 0<x\leq 1$	✓✓^{a} (2) **[11]**

VRAAG 5

(a)	$f(x)=-2x^2+3x$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $f'(x)=\lim_{h\to 0}\frac{-2(x+h)^2+3(x+h)-(-2x^2+3x)}{h}$ $f'(x)=\lim_{h\to 0}\frac{-2x^2-4xh-2h^2+3x+3h+2x^2-3x}{h}$ $f'(x)=\lim_{h\to 0}\frac{-4xh-2h^2+3h}{h}$ $f'(x)=\lim_{h\to 0}\frac{h(-4x-2h+3)}{h}$ $f'(x)=\lim_{h\to 0}(-4x-2h+3)$ $=-4x+3$	✓ $\frac{-2(x+h)^2+3(x+h)-(-2x^2+3x)}{h}$ ✓ Kwadrering en verspreiding ✓ Faktorisering ✓ Notasie ✓ Vervang en kry: $=-4x+3$ (5)
(b)(1)	$y=2x^3-4x+5$ $\frac{dy}{dx}=6x^2-4$	✓a $6x^2$ ✓ca -4 (2)
(b)(2)	$y=x^{-\frac{2}{5}}$ $\frac{dy}{dx}=-\frac{2}{5}x^{-\frac{7}{5}}$	$y=x^{-\frac{2}{5}}$ $\frac{dy}{dx}=-\frac{2}{5}x^{-\frac{7}{5}}$ (2)
(c)	Vir $f'(x)>0$ $f'(x)=-x^2+2x+3=0$ $x=3$ of $x=-1$ Stygend vir: $-1\le x\le 3$ Aanvaar ook <	✓a $f'(x)=-x^2+2x+3$ ✓a $f'(x)=0$ ✓ca $x=3$ of $x=-1$ ✓ca✓ca $-1\le x\le 3$ (5) **[14]**

VRAAG 6

(a)(1)	Nee Daar is 6 leerders wat beide krieket en basketbal speel.	✓a Nee ✓a Verduideliking (2)
(a)(2)	$P(K \text{ of } B) = P(K) + P(B) - P(K \text{ en } B)$ $P(K \text{ of } B) = \frac{20}{40} + \frac{25}{40} - \frac{6}{40}$ $= \frac{39}{40}$ Alternatief:  $P(K \text{ of } B) = \frac{39}{40}$	✓a $\frac{20}{40} + \frac{25}{40}$ ✓a $-\frac{6}{40}$ ✓a $= \frac{39}{40}$ (3)
(b)(1)	 	✓a korrekte diagram ✓a korrekte M-waarskynlikhede ✓a korrekte S-waarskynlikhede (3)
(b)(2)	P(M en S) OF P(S en M) $= \frac{10}{20} \times \frac{10}{19} + \frac{10}{20} \times \frac{10}{19}$ $= \frac{10}{19}$	✓a $\frac{10}{20} \times \frac{10}{19}$ ✓a $\frac{10}{20} \times \frac{10}{19}$ ✓ca $\frac{10}{19}$ (3)
(c)	$\frac{4!}{6!}$ $= \frac{4!}{6 \times 5 \times 4!}$ $= \frac{1}{30}$	✓a $\frac{4!}{6!}$ ✓a $= \frac{4!}{6 \times 5 \times 4!}$ ✓a $= \frac{1}{30}$ (3) **[14]**

73 punte

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AFDELING B

VRAAG 7

(a)	$3\,500\,000 = P\left(1+\frac{4,5}{100}\right)^{13}$ $P = \text{R}1\ 974\ 950,74$	✓ Korrekte formule ✓a $3\,500\,000 = P\left(1+\frac{4,5}{100}\right)^{13}$ ✓ca $P = \text{R}1\ 974\ 950,74$ (3)
(b)	$1\,800\,000\left(1+\frac{5}{100}\right)^{n} = 1974\,950,74\left(1+\frac{4,5}{100}\right)^{n}$ $\frac{\left(1+\frac{5}{100}\right)^{n}}{\left(1+\frac{4,5}{100}\right)^{n}} = \frac{1974\,950,74}{1800\,000}$ $\left(\frac{1,05}{1,045}\right)^{n} = 1,0971948...$ $n = 19,4$ Jaar: 2027	✓ca✓m $1\,800\,000\left(1+\frac{5}{100}\right)^{n} = 1974\,950,74\left(1+\frac{4,5}{100}\right)^{n}$ ✓ca $\frac{\left(1+\frac{5}{100}\right)^{n}}{\left(1+\frac{4,5}{100}\right)^{n}} = \frac{1974\,950,74}{1800\,000}$ ✓ca $n = 19,4$ ✓ca2027 (5) **[8]**

VRAAG 8

(a)	$7 + x + y = -2x - 7$ $y = -3x - 14$ $\frac{x}{7} = \frac{-3x-14}{x}$ $x^2 + 21x + 98 = 0$ $x = -7$ of $x = -14$ $y = 7$ of $y = 28$	✓a $7 + x + y = -2x - 7$ ✓a ✓a $\frac{x}{7} = \frac{-3x-14}{x}$ ✓ca✓ca $x = -7$ of $x = -14$ ✓ca✓ca $y = 7$ of $y = 28$ (7)
(b)	$S_n = \frac{n}{2}[2a + (n-1)d]$ $160 = \frac{n}{2}[2a + (n-1)(5)]$ $320 = 2an + 5n^2 - 5n$ $725 = \frac{2n}{2}[2a + (2n-1)(5)]$ $725 = 2an + 10n^2 - 5n$ $405 = 5n^2$ $n = 9$	✓a $160 = \frac{n}{2}[2a + (n-1)(5)]$ ✓ca $320 = 2an + 5n^2 - 5n$ ✓a $725 = \frac{2n}{2}[2a + (2n-1)(5)]$ ✓ca $725 = \frac{2n}{2}[2a + (2n-1)(5)]$ ✓ca $405 = 5n^2$ ✓ca $n = 9$ (6) **[13]**

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VRAAG 9

(a)	$y = a(x+1)^2 + q$ vervang $(-4;0)$ $0 = a(-4+1)^2 + q$ $0 = 9a + q$ .. verg. 1 $y = a(x+1)^2 + q$ vervang $(-2;4)$ $4 = a(-2+1)^2 + q$ $4 = a + q$ ... verg. 2 $a = -\frac{1}{2}$ $q = \frac{9}{2}$ $y = -\frac{1}{2}(x+1)^2 + \frac{9}{2}$ $y = -\frac{1}{2}x^2 - x + 4$ $\therefore a = -\frac{1}{2}$; $b = -1$; $c = 4$ **OF** x-afsnitte is –4 en 2 $y = a(x+4)(x-2)$ Vervang (–2; 4) $4 = a(-2+4)(-2-2)$ $\therefore a = -\frac{1}{2}$ $y = -\frac{1}{2}(x+4)(x-2)$ $y = -\frac{1}{2}x^2 - x + 4$ $\therefore a = -\frac{1}{2}$; $b = -1$; $c = 4$	$y = a(x+1)^2 + q$ ✓ca $0 = 9a + q$ .. verg. 1 ✓ca $4 = a + q$ ... verg. 2 ✓ca $a = -\frac{1}{2}$ ✓ca $b = -1$ ✓ca $c = 4$ (5) ✓a $y = a(x+4)(x-2)$ Korrekte vervanging ✓ca ✓ca $a = -\frac{1}{2}$ ✓ca $b = -1$ ✓ca $c = 4$
(b)(1)	$f(x) = -\frac{1}{2}(x^2 + 2x - 8)$ $f(x) = -\frac{1}{2}\left[(x+1)^2 - 8 - 1\right]$ $f(x) = -\frac{1}{2}\left[(x+1)^2 - 9\right]$ $f(x) = -\frac{1}{2}(x+1)^2 + \frac{9}{2}$	✓a $f(x) = -\frac{1}{2}(x^2 + 2x - 8)$ ✓a $f(x) = -\frac{1}{2}\left[(x+1)^2 - 8 - 1\right]$ ✓a $f(x) = -\frac{1}{2}\left[(x+1)^2 - 9\right]$ (3)
(b)(2)	$-2 < x < 0$ en $x \neq -1$	✓a $-2 < x < 0$ ✓a ✓a $x \neq -1$ (3)
(c)	X-afsnit van g: $x = -8$ X-afsnit van f: $x = 2$ of $x = -4$ $x \in [-8;-4] \cup [2;\infty)$	✓a ✓a $x \in [-8;-4]$ ✓ca $[2;\infty)$ (3)

(d)	Boonste – Onderste $= x+8-\left[-\frac{1}{2}(x+1)^2+\frac{9}{2}\right]$ $= x+8+\frac{1}{2}x^2+x-4$ $= \frac{1}{2}x^2+2x+4$ $\frac{dy}{dx} = x+2$ $\therefore x = -2$ Boonste – Onderste $= \frac{1}{2}x^2+2x+4$ ... vervang $x=-2$ $\therefore$ Maksimum 2 eenhede	✓a $= x+8-\left[-\frac{1}{2}(x+1)^2+\frac{9}{2}\right]$ ✓ca $= \frac{1}{2}x^2+2x+4$ ✓ca $\frac{dy}{dx} = x+2$ ✓ca $\therefore x = -2$ ✓ca $\frac{1}{2}x^2+2x+4$ ...vervang $x=-2$ ✓ca$\therefore$ Maksimum 2 eenhede (5) **[19]**

VRAAG 10

$y = a(-x)^2-7(-x)+c$ $\therefore b = 7$ $-\frac{b}{2a} = 1$ $\therefore a = -\frac{7}{2}$ $f(x) = -\frac{7}{2}x^2+7x+c$ vervang $(4;-20)$ $-20 = -\frac{7}{2}(4)^2+7(4)+c$ $c = 8$ $\therefore f(x) = -\frac{7}{2}x^2+7x+8$	✓a $y = a(-x)^2-7(-x)+c$ ✓a $\therefore b = 7$ ✓ca $-\frac{b}{2a} = 1$ ✓ca $\therefore a = -\frac{7}{2}$ ✓ca $-20 = -\frac{7}{2}(4)^2+7(4)+c$ ✓ca $c = 8$
Alternatief: $f(x) = a(-x)^2-7(-x)+c$ $f(x) = ax^2+7x+c$ $f'(x) = 2ax+7$ vir DP vervang $(x=1)$ $2a(1)+7 = 0$ $\therefore a = -\frac{7}{2}$ $\therefore b = 7$ $f(x) = -\frac{7}{2}x^2+7x+c$ vervang $(4;-20)$ $-20 = -\frac{7}{2}(4)^2+7(4)+c$ $c = 8$ $\therefore f(x) = -\frac{7}{2}x^2+7x+8$	✓a $y = a(-x)^2-7(-x)+c$ ✓ca $f'(x) = 2ax+7$ ✓ca $\therefore a = -\frac{7}{2}$ ✓a $\therefore b = 7$ ✓ca $-20 = -\frac{7}{2}(4)^2+7(4)+c$ ✓ca $c = 8$ **[6]**

VRAAG 11

(a)	$-3^3+5\times3^2-3\times5+d=0$ $d=9$ **Alternatief:** $y=-1(x-3)(x-3)(x+p)$ $y=-1(x^2-6x+9)(x+p)$ $y=-1(x^3-6x^2+9x+px^2-6px+9p)$ $y=-x^3+(6-p)x^2-(9-6p)x-9p$ $\therefore 9-6p=3$ $p=1$ $\therefore d=-9(p)=-9$	✓a $-3^3+5\times3^2-3\times5+d=0$ ✓ca $d=9$ $-1(x-3)(x-3)(x+p)$ $-x^3+(6-p)x^2-(9-6p)x-9p$ ✓a $\therefore 9-6p=3$ $p=1$ ✓ca $\therefore d=-9(p)=-9$ (2)
(b)	$f'(x)=-3x^2+10x-3$ $f''(x)=-6x+10=0$ $-6x=-10$ $x=\frac{5}{3}$ Gradiënt = $-3\left(\frac{5}{3}\right)^2+10\times\frac{5}{3}-3$ $=\frac{16}{3}$	✓a $f'(x)=-3x^2+10x-3$ ✓ca $f''(x)=-6x+10=0$ ✓ca $x=\frac{5}{3}$ ✓ca $-3\left(\frac{5}{3}\right)^2+10\times\frac{5}{3}-3$ ✓ca $=\frac{16}{3}$ (5)
(c)	$x<\frac{5}{3}$ Laat $x\le\frac{5}{3}$ toe	✓ca $x<\frac{5}{3}$ (1)
(d)	$f(x)-k+3=0$ $f(x)=k-3$ $f'(x)=-3x^2+10x-3=0$ $x=3$ of $x=\frac{1}{3}$ Wanneer $x=\frac{1}{3}$; $y=-\frac{256}{27}$ $\therefore -\frac{256}{27}\le k-3\le0$ $\therefore -\frac{175}{27}\le k\le3$	✓m afgeleide =0 ✓ca $x=3$ of $x=\frac{1}{3}$ vervanging van 'n derde ✓ca $y=-\frac{256}{27}$ ✓ca $\therefore -\frac{256}{27}\le k-3\le0$ ✓ca $\therefore -\frac{175}{27}\le k\le3$ (5) **[13]**

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VRAAG 12

(a)	$f'(0)=15$	✓a $f'(0)=15$ (1)
(b)	$f'(a)=0$ $\therefore a=10$	✓a $\therefore a=10$ (1)
(c)	$m=\frac{15-0}{0-10}=-\frac{3}{2}$ $f'(x)=-\frac{3}{2}x+15$ $\therefore f'(1)=13,5$	✓m ✓a ✓ca vir vergelyking ✓ca vir gradiënt (4)
(d)	Grafiek is konkaaf af – geen buigpunt nie	✓a (1) **[7]**

VRAAG 13

(a)	Laat: $x^2+2tx-t=x-\frac{5}{2}$ $x^2+(2t-1)x+\left(\frac{5}{2}-t\right)=0$ $\Delta=(2t-1)^2-4(1)\left(\frac{5}{2}-t\right)$ $4t^2-9<0$ Kritieke waardes: $-\frac{3}{2};\frac{3}{2}$ Sal nooit raak nie vir: $-\frac{3}{2}<t<\frac{3}{2}$	✓a $x^2+2tx-t=x-\frac{5}{2}$ ✓a $\Delta=(2t-1)^2-4(1)\left(\frac{5}{2}-t\right)$ ✓a $\Delta<0$ of enige metode ✓a $4t^2-9<0$ ✓ca Kritieke waardes: $-\frac{3}{2};\frac{3}{2}$ ✓ca $-\frac{3}{2}<t<\frac{3}{2}$ (6)
(b)	$\frac{500}{x}-\frac{500}{x+3}=40$ $40x^2+120x-1500=0$ $2x^2+6x-75=0$ $x=4,8$ of $x=-7,8$ Oorspronklike tyd: $\frac{500}{4,805}$ $=104,1$ sekondes	✓a $\frac{500}{x}-\frac{500}{x+3}=40$ ✓a $40x^2+120x-1500=0$ ✓a ✓a $x=4,8$ of $x=-7,8$ ✓a $\frac{500}{4,805}$ $=104,1$ sekondes (5) **[11]**

77 punte

Totaal: 150 punte

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