NASIONALE SENIOR SERTIFIKAAT-EKSAMEN
NOVEMBER 2024

WISKUNDE: VRAESTEL I
NASIENRIGLYNE

Tyd: 3 uur 150 punte

Hierdie nasienriglyne is opgestel vir gebruik deur eksaminators en hulp-eksaminators 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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AFDELING A

VRAAG 1

(a) (1) $\left(\frac{x}{4}-1\right)(x+2)=0$

$x=4 \quad \text{of} \quad x=-2$

(2) $2x^2-x-12=0$

$2x^2-x-12=0$

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$x=\frac{1\pm\sqrt{(-1)^2-4(2)(-12)}}{2(2)}$

$x=-2{,}21 \quad \text{of} \quad x=2{,}71$

(3) $x^2+2x\le 0.$

$x^2+2x\le 0$

$x(x+2)\le 0$

Kritieke waardes: $x=0$ en $x=-2$

$\therefore -2\le x\le 0$

(b) $x\left(\frac{1}{2}x+2\right)=-k^2$

$\frac{1}{2}x^2+2x+k^2=0$ ALT $x^2+4x+2k^2=0$

$\Delta=b^2-4ac$ $\Delta=b^2-4ac$

$0=(2)^2-4\left(\frac{1}{2}\right)(k^2)$ $=(4)^2-4(1)(2k^2)$

$0=4-2k^2$ $0=16-8k^2$

$2k^2=4$ $8k^2=16$

$k^2=2$ $k^2=2$

$k=\pm\sqrt{2}$ $k=\pm\sqrt{2}$

(twee waardes) (twee waardes)

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VRAAG 2

(a) $3^{x+2y} = \frac{9^{3y}}{27}$

$3^{x+2y} = \frac{3^{6y}}{3^3}$

$3^{x+2y} = 3^{6y-3}$

$x + 2y = 6y - 3$

$x = 4y - 3$

(b) $\sqrt{x+8} - x = 2$

$\sqrt{x+8} = 2 + x$

$x + 8 = (x+2)^2$

$x + 8 = x^2 + 4x + 4$

$0 = x^2 + 3x - 4$

$0 = (x+4)(x-1)$

$x \neq -4 \quad or \quad x = 1$

(c) (1) $\log 6 + \log 3$

$= x + y$

(2) $\log 3^{\frac{1}{2}}$

$= \frac{1}{2}\log 3$

$= \frac{1}{2}y$

(3) $\log \frac{6}{3}$

$= \log 6 - \log 3$

$= x - y$

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VRAAG 3

(a) $f(x) = x^2 + 1$

$$f'(x) = \lim_{h \to 0} \frac{(x+h)^2 + 1 - \left(x^2 + 1\right)}{h}$$
$$= \lim_{h \to 0} \frac{x^2 + 2xh + h^2 + 1 - x^2 - 1}{h}$$
$$= \lim_{h \to 0} \frac{2xh + h^2}{h}$$
$$= \lim_{h \to 0} \frac{h(2x + h)}{h}$$
$$= 2x \checkmark$$

notasie ✓

(b)

$$f(x) = 2x^4 + \frac{1}{\sqrt[4]{x}} - 4$$
$$= 2x^4 + x^{-\frac{1}{4}} - 4$$
$$f'(x) = 8x^3 - \frac{1}{4}x^{-\frac{5}{4}}$$

(c) (1) $x^2 - 3x - 4 = 0$

$(x-4)(x+1) = 0$

$x = 4$ of $x = -1$

$A(-1\,;\,0)$ en $B(4\,;\,0)$

(2) Bepaal die koördinate van D

$f'(x) = 2x - 3$

$x = \frac{3}{2}$

$f\left(\frac{3}{2}\right) = -\frac{25}{4}$

$\therefore D\left(\frac{3}{2}; -\frac{25}{4}\right)$

ALT $x = -\frac{(-3)}{2(1)}$

$x = \frac{3}{2}$

$f\left(\frac{3}{2}\right) = -\frac{25}{4}$

$\therefore D\left(\frac{3}{2}; -\frac{25}{4}\right)$

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(3) $x < \frac{3}{2}$

(4) $m = -4$

$$2x - 3 = -4$$
$$2x = -1$$
$$x = -\frac{1}{2}$$

VRAAG 4

(a) $(3x+1)-(5x-1) = 2x-(3x+1)$ ✓✓

$$-2x+2 = -x-1$$
$$-x = -3$$
$$x = 3$$
$$14\,;10\,;6$$

(b) $T_n = a+(n-1)d$

$$= 14+(n-1)(-4)$$
$$= 18-4n$$

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VRAAG 5

(a) $f(x)=x^3+px^2+3x-9$ vervang $E\left(-\frac{5}{3};y\right)$

$$f'(x)=3x^2+2px+3$$
$$f''(x)=6x+2p$$
$$0=6\left(-\frac{5}{3}\right)+2p$$
$$p=5$$

(b) (1) $f(x)=x^3+5x^2+3x-9$

$$f(x)=x^3+5x^2+3x-9$$
$$f'(x)=3x^2+10x+3$$
$$0=3x^2+10x+3$$
$$0=(3x+1)(x+3)$$
$$x=-3 \quad \text{or} \quad x=-\frac{1}{3}$$
$$f\left(-\frac{1}{3}\right)=\left(-\frac{1}{3}\right)^3+5\left(-\frac{1}{3}\right)^2+3\left(-\frac{1}{3}\right)-9$$
$$=-\frac{256}{27}$$
$$C\left(-\frac{1}{3};-\frac{256}{27}\right) \quad \text{ALT} \quad C\left(-\frac{1}{3};-9\frac{13}{27}\right)$$

(2) $0=x^3+5x^2+3x-9$

$$0=(x-1)(x+3)^2$$
$$x=1 \text{ of } x=-3$$
$$B(1;0)$$

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VRAAG 6

(a) $1+i_{eff}=\left(1+\frac{i}{n}\right)^{n}$

$$1+i_{eff}=\left(1+\frac{0,06}{4}\right)^{4}$$

$$i_{eff}=0,06136$$

$$\therefore i_{eff}=6,14\%\text{ p.j.}$$

(b) (1) Deposito = R235 000

$$705\,000=\frac{x\left[1-\left(1+\frac{0,1125}{12}\right)^{-20\times12}\right]}{\frac{0,1125}{12}}$$ Verkeerde formule maksimum in is Y-i deposito

$$x=7\,397,25$$

(2)

$$\text{Uitstaande saldo}=705\ 000\left(1+\frac{0,1125}{12}\right)^{11\times12}-\frac{7\,397,25\left[\left(1+\frac{0,1125}{12}\right)^{11\times12}-1\right]}{\frac{0,1125}{12}}$$

$$=501\,020,53$$

samestelling is korrek – Huidige waarde
705 000 moet langs die korrekte hakie wees.

ALT

$$\text{Uitstaande saldo}=7\,397,25\frac{\left[1-\left(1+\frac{0.1125}{12}\right)^{-108}\right]}{\frac{0.1125}{12}}$$

$$=501\,018,93$$

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AFDELING B

VRAAG 7

(a)

$$\begin{array}{ccccccc} 3 & ; & 9 & ; & 17 & ; & 27 \;; 39;... \\ & 6 & & 8 & & 10 & \quad 12 \\ & & 2 & & 2 & & 2 \end{array}$$

$$\begin{aligned} 2a &= 2 \\ a &= 1 \\ 3a + b &= 6 \\ 3 + b &= 6 \\ b &= 3 \\ a + b + c &= 3 \\ 1 + 3 + c &= 3 \\ c &= -1 \end{aligned}$$

$$\therefore T_n = n^2 + 3n - 1$$

(b)

$$T_n = n^2 + 3n - 1$$

$$n^2 + 3n - 1 = 161$$

$$n^2 + 3n - 162 = 0$$

$$\Delta = b^2 - 4ac$$

$$= (3)^2 - 4(1)(-162)$$

$$= 657$$

Wortels : Irrasionaal en ongelyk

Tlhogi is verkeerd.

ALT $n^2 + 3n - 162 = 0$

$$n = -\frac{3 \pm \sqrt{3^2 - 4(1)(-162)}}{2}$$

$n = 14,32$ of $n = -11,32$

Tlhogi is verkeerd.

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VRAAG 8

(a) (1) $1+\left(\frac{x+2}{2}\right)^1+\left(\frac{x+2}{2}\right)^2+....$

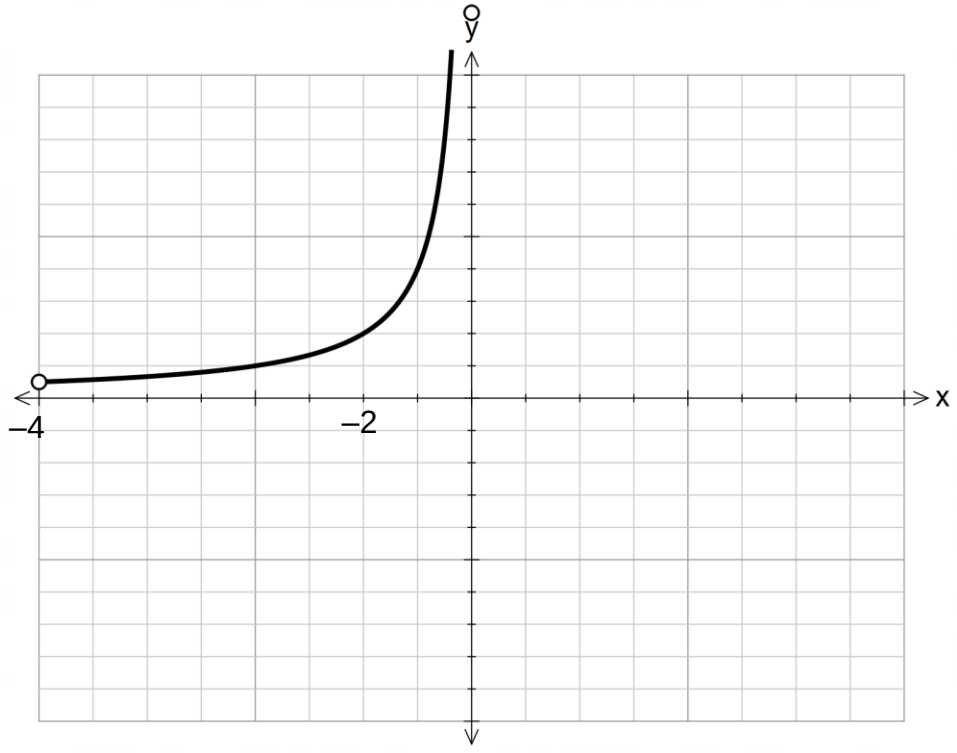
(2) $-1<r<1$ en

$$-1<\left(\frac{x+2}{2}\right)<1$$
$$-2<x+2<2$$
$$-4<x<0$$

(3) $1+\left(\frac{x+2}{2}\right)^1+\left(\frac{x+2}{2}\right)^2+....$

$$s_\infty=\frac{1}{1-\left(1+\frac{x}{2}\right)}$$
$$=-\frac{2}{x}$$

(4) Vorm Beperking Asimptoot



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(b) (1) $0 = -\frac{20}{11449}x^2 + 20$

$x = \pm 107$

$x = 107$

$\therefore a = 107$

(2) $r = \frac{2}{3}$

middellyn $= 36$ P

$\pi r^2 = 324$

$r = 18$

$S_n = 36 + 24 + 16 + \ldots$

$S_n < 107$

$\frac{36\left[\left(\frac{2}{3}\right)^n - 1\right]}{\frac{2}{3} - 1} < 107$

$\left(\frac{2}{3}\right)^n > \frac{1}{108}$

$n < 11.5$

$\therefore n = 11$

ALT $\frac{36\left[\left(\frac{2}{3}\right)^n - 1\right]}{\frac{2}{3} - 1} = 107$

$\left(\frac{2}{3}\right)^n = \frac{1}{108}$

$n = 11,55$

$\therefore n = 11$

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VRAAG 9

(a) (1) $x \in \mathrm{R} \quad x \neq 2$

(2) $f(x) = a(x-2)^2 + 3 \quad \text{vervang}\,(3;5)$

$5 = a(3-2)^2 + 3$

$5 = a + 3$

$a = 2$

$f(x) = 2(x-2)^2 + 3$

(3) $g(x) = \dfrac{k}{x-2} + 3 \quad \text{vervang}\,(3;5)$

$5 = \dfrac{k}{3-2} + 3$

$\mathrm{k} = 2$

$g(x) = \dfrac{2}{x-2} + 3 \qquad\qquad f(x) = 2(x-2)^2 + 3$

$\mathrm{AB} = 2(0-2)^2 + 3 - \left[\dfrac{2}{0-2} + 3\right]$

$= 11 - 2$

$= 9$

(4) $0 = \dfrac{2}{x-2} + 3$

$0 = 2 + 3x - 6$

$-3x = -4$

$x = \dfrac{4}{3}$

$x < \dfrac{4}{3} \quad \text{of} \quad x > 2$

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(b) $h\left(\frac{31}{10}\right) = -1$

$$\log_k(4+m) = 0$$
$$4+m = k^0$$
$$4+m = 1$$
$$m = -3$$

$$-1 = \log_k\left(\frac{31}{10} - 3\right)$$
$$\log_k\left(\frac{1}{10}\right) = -1$$
$$\frac{1}{10} = k^{-1}$$
$$10 = k$$

ALT

$$\log_k(4+m) = 0$$
$$4+m = k^0$$
$$4+m = 1$$
$$m = -3$$

$$\log_k(y+m) = x$$
$$y = k^x - m$$
$$\frac{31}{10} = k^{-1} + 3$$
$$\frac{1}{k} = \frac{1}{10}$$
$$k = 10$$

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VRAAG 10

(a) $f'(x) = 2x - 14$

$f'(8) = 2$

$f(8) = -5$

$y = 2x + c$ vervang $(8; -5)$

$-5 = 2(8) + c$

$c = -21$

$y = 2x - 21$

ALT $y + 5 = 2(x - 8)$

$y + 5 = 2x - 16$

$y = 2x - 21$

(b) $g'(x) = -2x + 10$

As die verskil f(x) = 2 is en die helling gelyk is, dan BD (Nul).

$-2x + 10 = 2$

$x = 4$

$B(4; -13)$

$g(x) = -x^2 + 10x - 19 + k$ vervang $B(4; -13)$

$-13 = -(4)^2 + 10(4) - 19 + k$

$k = -18$

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VRAAG 11

$3OG = EF = 2OE$ of $\frac{OG}{OE} = \frac{2}{3}$

$y = -\frac{2}{3}x + \frac{2}{3}k$ ALT indien $\mathrm{B}(x;y)$ dan $\frac{y}{k-x} = \frac{2}{3}$ $\therefore y = \frac{2}{3}(k-x)$

$$\mathrm{A} = 2x.y$$
$$\mathrm{A} = 2x\left(-\frac{2}{3}x + \frac{2}{3}k\right)$$
$$= -\frac{4}{3}x^2 + \frac{4}{3}xk$$
$$\frac{d\mathrm{A}}{dx} = -\frac{8}{3}x + \frac{4}{3}k = 0$$

$$8x = 4k$$
$$x = \frac{1}{2}k$$
$$\mathrm{A} = 2.\frac{1}{2}k\left(-\frac{2}{3}.\frac{1}{2}k + \frac{2}{3}k\right)$$
$$= k\left(-\frac{1}{3}k + \frac{2}{3}k\right)$$
$$= \frac{1}{3}k^2$$

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VRAAG 12

(a) (1) $10 \times 9 \times 8 \times 7$
$9 \times 8 \times 7 \times 6$
$10!/6!$
$10P4$

(2) Presies twee 9's in die PIN

9 9 - -
- - 9 9
9 - - 9
- 9 - 9
9 - - 9
- 9 9 -

$\therefore 6 \times 9 \times 9$

$= P$ (Presies twee 9's in die PIN)

$= \dfrac{6 \times 9 \times 9}{10 \times 10 \times 10 \times 10}$

$= \dfrac{243}{5000}$ of $0{,}05$

(n(s) moet sin maak 9"4 iets met 4 posisies om P(A) te kry)

ALT

Twee 9's in 4 posisies:

$4C_2 = 6$

$\therefore (1 \times 1 \times 9 \times 9) \times 6$

$= P$ (Presies twee 9's in die PIN)

$= \dfrac{(1 \times 1 \times 9 \times 9) \times 6}{10 \times 10 \times 10 \times 10}$

$= \dfrac{243}{5000}$ of $0{,}05$

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(b) $4\left(\frac{1}{4}\right) = 5P(A \cap B)$ ✓

$P(A \cap B) = \frac{1}{5}$

$y = \frac{1}{5} \times 80$

$= 16$

$z + y = 20$

$z = 4$

Slegs A is 24

$x + z = 40$

$x = 36$

ALT

$P(A) = \frac{1}{2}$ $\therefore n(A) = 40$ $\therefore x + 40 + z = 80$

Slegs A is 24

$x + z = 40$ $y = 16$ $z = 4$

$x = 36$

ALT

$4(y + z) = 5y$ $\therefore y = 4z$ en $y + z = 20$ maar $x + z = 40$

Dus $5z = 20$

$\therefore z = 4$

$y = 16$

$x + z = 40$

$\therefore x = 36$

Totaal: 150 punte

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