NASIONALE SENIOR SERTIFIKAAT-EKSAMEN
MEI 2024

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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VRAAG 1

(a) $(3x - 4)(x + 3)(x + 3) = 0$

$x = \frac{4}{3}$ of $x = -3$

(b) Geen reële oplossings nie

(c) $\log_x 5 = 3$

$x^3 = 5$

$x = \sqrt[3]{5} = 1{,}7$

(d) $4^{x+1} + 2^{2x} = 40$

$2^{2x+2} + 2^{2x} = 40$

$2^{2x}(2^2 + 1) = 40$

$2^{2x} = 2^3$

$2x = 3$

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

(e) $\frac{8 - 4x}{x - 2} = x$ Alternatief: $8 - 4x = x^2 - 2x \ \therefore \ x^2 + 2x - 8 = 0$

$\frac{-4(x-2)}{(x-2)} = x$ Dus $(x + 4)(x - 2) = 0$

$x = -4$ $x = -4$ of $x \neq 2$

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

$x = -k \pm \sqrt{2k+1}$

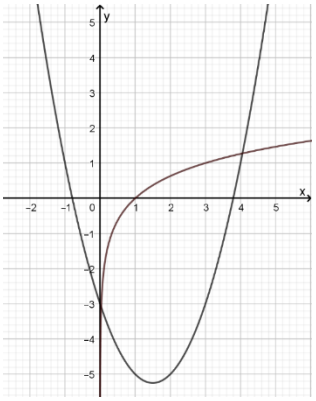
ALT: $x^2 + 2kx + (k^2 - 2k - 1) = 0$ $x = \frac{-2k \pm \sqrt{4k^2 - 4\left(k^2 - 2k - 1\right)}}{2} = \frac{-2k \pm \sqrt{4\left(2k+1\right)}}{2}$

(2) $k = \frac{3}{2}$ of $k = 4$ of $k = \frac{15}{2}$ of $k = 12$

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VRAAG 2

(a)



x-afsnit (1; 0)

Vorm

Asimptoot $x = 0$

(b) $x = \log_3 (y)$

$y = 3^x$

(c) (1) $y = \log_3 (x - 1)$

(2) x = 1

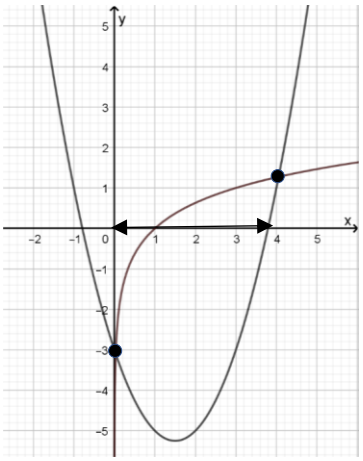
(d) (1) $f(x) = x^2 - 3x + \frac{9}{4} - 3 - \frac{9}{4}$

$f(x) = \left(x - \frac{3}{2}\right)^2 - \frac{21}{4}$

(2) $x \in (-\infty; \infty)$ en $y \in [-\frac{21}{4}; \infty)$ notasie

(e) $x = 3$

(f)



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VRAAG 3

(a) $f(x) = x^2 - x$

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

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

$$= \lim_{h \to 0}\left(\frac{h(2x + h - 1)}{h}\right)$$

$$= \lim_{h \to 0}(2x + h - 1)$$

$f'(x) = 2x - 1$ notasie

(b) $g(x) = 4x^3 - 2x^{-2} + \sqrt[8]{x}$

$g(x) = 4x^3 - 2x^{-2} + x^{\frac{1}{8}}$

$g'(x) = 12x^2 + 4x^{-3} + \frac{1}{8}x^{-\frac{7}{8}}$

(c) $h(x) = 3x^2 - 4x$

$h(1) = -1$

$h'(x) = 6x - 4$

$h'(1) = 2$

$y = 2x + c$ *Alternatief*: $y + 1 = 2(x - 1)$ $\therefore$ $y = 2x - 3$

$-1 = 2(1) + c$

$c = -3$

Raaklyn by $x = 1$

$y = 2x - 3$

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VRAAG 4

(a) (1) $T_n = 15 + (n - 1)(-4)$

$T_n = -4n + 19$

(2) $15 + 11 + 7 + 3 - 1 - 5 + \ldots - 2009 - 213$

$-4n + 19 = -213$

$-4n = -232$

$n = 58$

$S_n = \frac{58}{2}(2(15) + (58 - 1)(-4))$

$S_n = -5\,742$

(b) $$\frac{\frac{3}{5}}{1-\frac{3}{5}} + \frac{\frac{9}{25}\left(\left(\frac{3}{5}\right)^{19} - 1\right)}{\frac{3}{5} - 1}$$

$= \frac{3}{2} + 0{,}8999945\ldots$

$= 2{,}4$

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VRAAG 5

(a) (1) 6! OF 720 maniere

(2) 4! × 3! of 4!3!

= 144 maniere

(b) DRESSES

$= \frac{7!}{3!2!}$

= 420 maniere

VRAAG 6

(a) $1\ 500\ 000 = \frac{x\left(1-\left(1+\frac{0,11}{12}\right)^{-240}\right)}{\frac{0,11}{12}}$

x = R15 482,83

(b) $\text{Uitstaande saldo} = 1\ 500\ 000\left(1+\frac{0,11}{12}\right)^{108} - \frac{15\ 482,83\left(\left(1+\frac{0,11}{12}\right)^{108}-1\right)}{\frac{0,11}{12}}$

Uitstaande saldo = R1 182 585,03

Alternatief: $15\ 482,83 \times \frac{\left(1-\left(1+\frac{0,11}{12}\right)^{-132}\right)}{\frac{0,11}{12}} = 1\ 182\ 586,10$

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VRAAG 7

$$25000\left(1+\frac{0,15}{4}\right)^{32} + \frac{600\left(\left(1+\frac{0,15}{4}\right)^{32}-1\right)}{\frac{0,15}{4}}$$

R81 200,63 + R35 968,40

R117 169,03

VRAAG 8

(a) $f'(x) = -4x + 15$

$-4x + 15 = 3$

$x = 3$

$f(3) = -2(3)^2 + 15(3)$ Alternatief: Indien $-2x^2 + 15x = 3x + c$

$f(3) = 27$ $\therefore\ 2x^2 - 12x + c = 0$

$27 = 3(3) + c$ $\Delta = 0:\ 144 - 8c = 0$

$c = 18$ $\therefore\ c = 18$

$g(x) = 3x + 18$

$0 = 3x + 18$

$x = -6$

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(b) (1) $h(x) = ax^3 + bx^2$.

$h'(x) = 3ax^2 + 2bx$

$h''(x) = 6ax + 2b$

$6a(-1) + 2b = 0$

$2b = 6a$

$40 = 8a + 4b$ Vervang die punt (2;40) in

$20 = 4a + 2b$

$20 = 4a + 6a$

$20 = 10a$

$a = 2$

$b = 6$

(2) $y = 2(-1)^3 + 6(-1)^2$

$m(-1; 4)$

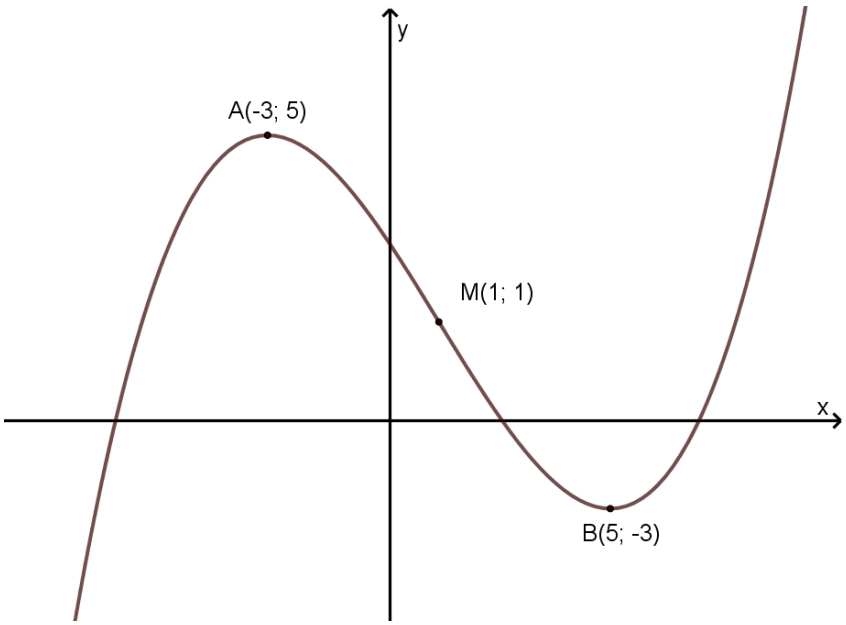
$P(0;4)$

PB = $\sqrt{(40-4)^2 + (2-0)^2}$

PB = $\sqrt{1300}$ = 36,1 km

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(c) (1)



Vorm A en B Drie *x*-afsnitte Buigpunt

(2) $t > 3$ of $t < -5$

VRAAG 9

(a) $-\log_3 x + (6 - 1)\log_3 x = 12$

$4\log_3 x = 12$

$\log_3 x = 3$

$x = 3^3 = 27$

Alternatief:

$-\log_3 x + (6 - 1)\log_3 x = 12$

$-\log_3 x + \log_3 x^5 = 12$

$\log_3 x^4 = 12$

$x^4 = 3^{12}$

$x = 27$

(b) $\dfrac{4x - 3}{2x + 6} = \dfrac{2x + 6}{5x + 1}$

$20x^2 - 11x - 3 = 4x^2 + 24x + 36$

$0 = 16x^2 - 35x - 39$

$x = 3$ of $x \neq -\dfrac{13}{16}$

$x = 3$ gee $r = \dfrac{3}{4}$ dus sal ry konvergeer

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VRAAG 10

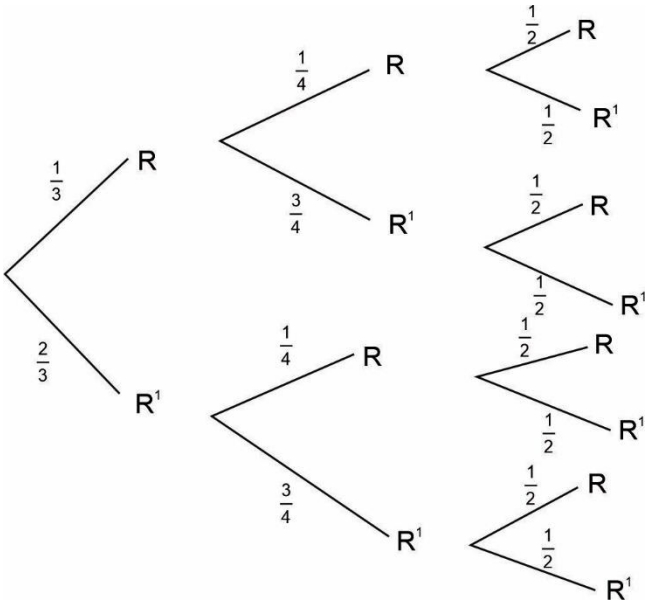
(a) (1) $3 \times 4 \times 2 \times 5 = 120$ maniere

(2) $1-\left(\frac{2}{3}\right)\left(\frac{3}{4}\right)\left(\frac{1}{2}\right)$ trek af

$\frac{18}{24}$ of $\frac{3}{4}$

$= 0{,}75$

Alternatief:



$$\frac{1}{3}\times\frac{1}{4}\times\frac{1}{2}\times 2+\frac{1}{3}\times\frac{3}{4}\times\frac{1}{2}\times 2+\frac{2}{3}\times\frac{1}{4}\times\frac{1}{2}\times 2+\frac{2}{3}\times\frac{3}{4}\times\frac{1}{2}=\frac{3}{4}$$

ALT: Uit boomdiagram: $\frac{1}{3}\times 1\times 1+\frac{2}{3}\times\frac{1}{4}\times 1+\frac{2}{3}\times\frac{3}{4}\times\frac{1}{2}=\frac{1}{3}+\frac{1}{6}+\frac{1}{4}=\frac{3}{4}$

(b) P(Veerpyltjie land in die gearseerde gebied) = $\frac{1}{3}$

P(Veerpyltjie land in die klein vierkant) = $\frac{2}{3}$.

Die waarskynlikheid dat een veerpyltjie in die gearseerde gebied land en die ander een nie

$\frac{1}{3}\times\frac{2}{3}+\frac{2}{3}\times\frac{1}{3}$

$=\frac{4}{9}$

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VRAAG 11

(a) $\frac{10}{x^2-5x-6} \geq 0$

$\frac{10}{(x-6)(x+1)} \geq 0$

$x < -1$ of $x > 6$ notasie

(b) $\sqrt{2x+1}-2=y$ en $\frac{\sqrt{x}}{\sqrt{y}}=2$

$\frac{x}{y}=4$

$x=4y$

$\sqrt{2(4y)+1}-2=y$

$8y+1=y^2+4y+4$

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

$0=(y-3)(y-1)$

$y=3$ of $y=1$

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

x = 4

$2x+1=(3+2)^2$

x = 12

(4; 1) of (12; 3)

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VRAAG 12

(a) (1) $f(x) = \dfrac{x-2+3}{x-2}$

$f(x) = \dfrac{3}{x-2} + 1$

$y = x + c$

$1 = 2 + c$ Vervang (2; 1) in

$c = -1$

$y = x - 1$

ALT: $m = 1$ dus $y - 1 = x - 2$

(2) $\dfrac{3}{x-2} + 1 = x - 1$

$3 = (x-2)^2$

$x = 2 \pm \sqrt{3}$

$A\left(2-\sqrt{3}; 1-\sqrt{3}\right)$

ALT: $3 + x - 2 = (x-1)(x-2) \ \therefore\ x^2 - 4x + 1 = 0 \ \therefore\ x = \dfrac{4 \pm \sqrt{12}}{2}$

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(b) FE = $y - 2x$

$2x + y - 2x + x + 2x + x + y = 20$

$4x + 2y = 20$

$y = 10 - 2x$

Oppervlakte = $2x(y - 2x) + 2x(x)$

Oppervlakte = $2xy - 2x^2$

Alt: Oppervlakte = oppervlakte groot reghoek ABHF – oppervlakte reghoek EDCH
= $2xy - 2x^2$

Oppervlakte = $2x(10 - 2x) - 2x^2$

Oppervlakte = $20x - 6x^2$

$\frac{dA}{dx} = 20 - 12x$

$20 - 12x = 0$

$x = \frac{5}{3}$

Totaal: 150 punte

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