



NASIONALE SENIOR SERTIFIKAAT-EKSAMEN
MEI

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.

AFDELING A**VRAAG 1**

(a) $x = 0$ of $x = 5$ of $x = \frac{1}{3}$

(b) $\sqrt{2x-1} - 7 = 0$

$$2x - 1 = 49$$

$$x = 25$$

(c) $y = 2x - 5$

$$x^2 - (2x - 5)^2 = 7$$

$$x^2 - 4x^2 + 20x - 25 = 7$$

$$3x^2 - 20x + 32 = 0$$

$$(3x - 8)(x - 4) = 0$$

$$x = 4 \text{ of } x = \frac{8}{3}$$

$$y = 3 \text{ of } y = \frac{1}{3}$$

VRAAG 2

$$\begin{aligned}
 \text{(a)} \quad (1) \quad f'(x) &= \lim_{h \rightarrow 0} \frac{2(x+h)^2 + 5 - (2x^2 + 5)}{h} \\
 &= \lim_{h \rightarrow 0} \frac{2(x^2 + 2xh + h^2) + 5 - (2x^2 + 5)}{h} \\
 &= \lim_{h \rightarrow 0} \frac{2x^2 + 4xh + 2h^2 + 5 - 2x^2 - 5}{h} \\
 &= \lim_{h \rightarrow 0} \frac{4xh + 2h^2}{h} \\
 &= \lim_{h \rightarrow 0} \frac{h(4x + 2h)}{h}
 \end{aligned}$$

$$f'(x) = 4x \text{ (Notasie)}$$

$$\text{(a)} \quad (2) \quad f'(3) = 4(3) = 12$$

$$f(3) = 2(3)^2 + 5 = 23$$

$$y = 12x + c$$

$$23 = 12(3) + c$$

$$c = -13$$

$$\text{Raaklynvergelyking } y = 12x - 13$$

$$\text{Alternatiewe oplossing: } y - 23 = 12(x - 3)$$

$$\text{(b)} \quad g(x) = \sqrt{x} + x + \frac{1}{x}$$

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

$$g'(x) = \frac{1}{2}x^{-\frac{1}{2}} + 1 - x^{-2}$$

VRAAG 3

(a) (1) 29 kolle

(2) $T_n = (n + 1)^2 + n$

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

Alternatiewe oplossing

5; 11; 19; 29.....

$$2a = 2 \quad 3(1) + b = 6 \quad (1) + (3) + c = 5$$

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

(b) $T_4 = 29$

$$T_{14} = 44$$

$$d = \frac{15}{10} = 1,5$$

$$T_1 = 29 - 3(1,5) = 24,5$$

Alternatiewe oplossing

$$a + 3d = 29$$

$$a + 13d = 44$$

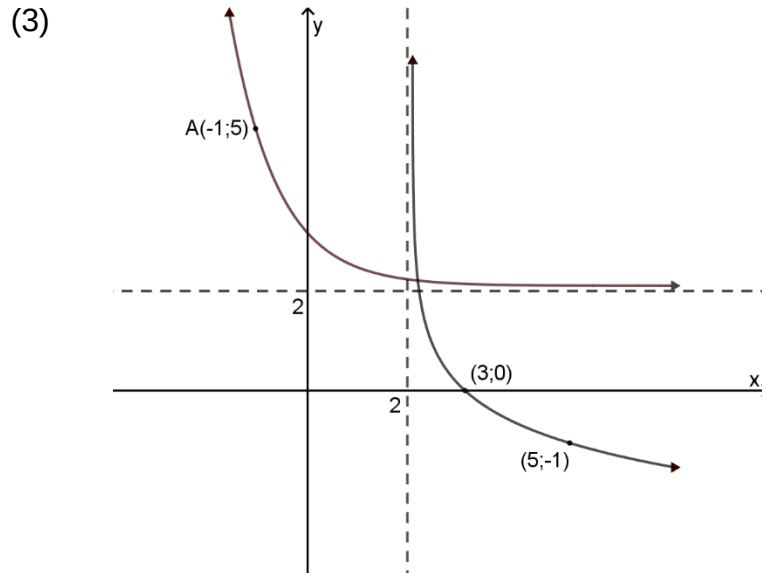
$$\therefore 10d = 15$$

$$d = 1,5$$

VRAAG 4

(a) (1) $a = \frac{1}{3}$ en $q = 2$

(2) y -afsnit van g is $(0; 3)$



x -afsnit punt $(5; -1)$ Asimptoot

(4) $2 < x < 3$

(b) (1) $f(x) = -x^2 + 5x - 4$

$C(0; -4)$

$0 = -x^2 + 5x - 4$

$x^2 - 5x + 4 = 0$

$x = 4$ of $x = 1$

$A(1; 0)$ en $B(4; 0)$

$f'(x) = -2x + 5$

$-2x + 5 = 0$

$x = \frac{5}{2}$

Draaipunt van $f(x)$ is $D\left(\frac{5}{2}; \frac{9}{4}\right)$

(2) $t = -\frac{9}{4}$

VRAAG 5

(a) Die horisontale asimptoot

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

$$y = 2$$

(b1) $CD = 2$ eenhede

$$(b2) \quad \frac{3}{x+1} + 2 = x + 3$$

$$\frac{3}{x+1} = x + 1 \quad \text{of} \quad 3 + 2(x + 1) = (x + 3)(x + 1) \therefore x^2 + 2x - 2 = 0$$

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

$$x = -1 \pm \sqrt{3}$$

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

$$B(-1 - \sqrt{3}; 2 - \sqrt{3})$$

(c) $x \in [-2, 7; -1) \cup [0, 7; \infty)$

OF

$$x \in [-1 - \sqrt{3}; -1) \cup [-1 + \sqrt{3}; \infty)$$

VRAAG 6

$$(a) \quad 820\,000 = \frac{x \left[1 - \left(1 + \frac{0,10}{12} \right)^{-240} \right]}{\frac{0,10}{12}}$$

$$x = R7\,913,18$$

$$(b) \quad 820\,000 = \frac{20\,000 \left[1 - \left(1 + \frac{0,10}{12} \right)^{-n} \right]}{\frac{0,10}{12}}$$

$$\left(1 + \frac{0,10}{12} \right)^{-n} = 0,6583333333 \therefore n = 50,4 \text{ dus } 51 \text{ maande}$$

AFDELING B**VRAAG 7**

$$F_v = \frac{750 \left[\left(1 + \frac{0,15}{12} \right)^{36} - 1 \right]}{\frac{0,15}{12}} \cdot \left(1 + \frac{0,15}{12} \right)^{84} = \text{R}96\,066,01366$$

$$F_v = \frac{500 \left[\left(1 + \frac{0,15}{12} \right)^{24} - 1 \right]}{\frac{0,15}{12}} \cdot \left(1 + \frac{0,15}{12} \right)^{60} = \text{R}29\,277,26617$$

Aan die einde van 10 jaar is die belegging R125 343,28 werd

VRAAG 8

(a) $3^{x+1} + 3^{x-1} = 20$

$$3^x(3 + 3^{-1}) = 20$$

$$3^x = 6$$

$$x = \log_3 6$$

Dus

$$w = 3 \quad \text{en} \quad t = 6$$

(b) $\frac{5^{-1}75^{2x}}{15^{4x}3^{-3x}} = k \times 3^x$

$$\frac{5^{-1}3^{2x}5^{4x}}{3^{4x}5^{4x}3^{-3x}}$$

$$5^{-1} \cdot 3^x$$

Dus

$$k = \frac{1}{5}$$

$$(c) \quad 3^{x^2 - px + 1} = 27$$

$$x^2 - px + 1 = 3$$

$$x^2 - px - 2 = 0$$

$$\Delta = (-p)^2 - 4(1)(-2)$$

$$\Delta = p^2 + 8$$

Dus $\Delta > 0$ en gevolglik is die wortels altyd reël en ongelyk.

VRAAG 9

$$y = a(x - 100)^2 + q$$

Vervang (200; 30) in

$$30 = a(200 - 100)^2 + q$$

$$30 = 10\,000a + q$$

Vervang (300; 0) in

$$0 = a(300 - 100)^2 + q$$

$$0 = 40\,000a + q$$

$$q = -40\,000a$$

Vervang in eerste vergelyking

$$30 = 10\,000a - 40\,000a$$

$$30 = -30\,000a$$

$$a = \frac{-1}{1\,000}$$

$$q = 40$$

Die gholfbal bereik 'n maksimum hoogte van 40 meter.

Alternatief: $y = ax^2 + bx + 30$

Vervang (200;30) en (300;0)

$$30 = 40\,000a + 200b + 30 \quad \text{en} \quad 0 = 90\,000a + 300b + 30$$

$$a = \frac{-1}{1\,000} \quad \text{en} \quad b = \frac{1}{5} \quad \text{gevolglik} \quad y = \frac{-1}{1\,000}x^2 + \frac{1}{5}x + 30$$

$$\frac{dy}{dx} = 0$$

$$\text{Dus } \frac{-2x}{1\,000} + \frac{1}{5} = 0 \quad \therefore x = 100 \text{ en } y = 40$$

VRAAG 10

(a) $0 = -x^3 + x^2 + 21x - 45$

$$0 = x^3 - x^2 - 21x + 45$$

$$0 = (x - 3)(x^2 + 2x - 15)$$

$$0 = (x - 3)(x - 3)(x + 5)$$

$$x = 3 \quad \text{of} \quad x = -5$$

(b) $h(x) = x^3 + ax^2 + bx + 36$

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

$$B(-1; 44)$$

$$h(-1) = -1 + a - b + 36$$

$$-1 + a - b + 36 = 44$$

$$a - b = 9$$

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

$$h'(-1) = 3 - 2a + b$$

$$3 - 2a + b = 0$$

$$b = 2a - 3$$

Los gelyktydig op:

$$a - (2a - 3) = 9$$

$$a - 2a + 3 = 9$$

$$a = -6$$

$$b = 2(-6) - 3$$

$$b = -15$$

VRAAG 11

(a) $26x + 10y = 10$

$$y = 1 - 2,6x$$

$$V = 4x^2y$$

$$V = 4x^2(1 - 2,6x)$$

$$V = 4x^2 - 10,4x^3$$

(b) $\frac{dV}{dx} = 8x - 31,2x^2$

$$8x - 31,2x^2 = 0$$

$$x(8 - 31,2x) = 0$$

$$x \neq 0 \quad \text{of} \quad x = 0,2564$$

$$y = 0,33$$

VRAAG 12

$$(a) \quad \frac{605}{243} = \frac{w(r^5 - 1)}{r - 1}$$

$$T_5 = w \cdot 3^{-5} \text{ dus } r = \frac{1}{3} \text{ of } T_1 = \frac{w}{3} \text{ en } T_2 = \frac{w}{9} \text{ dus } r = \frac{1}{3}$$

$$\frac{605}{243} = \frac{w \left(\left(\frac{1}{3} \right)^5 - 1 \right)}{\left(\frac{1}{3} \right) - 1}$$

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

$$(b) \quad \sum_{n=1}^{\infty} (2^{-n}) + \sum_{n=1}^p (2n + 1) = 484$$

$$S_{\infty} = \frac{\frac{1}{2}}{1 - \frac{1}{2}} = 1$$

$$\sum_{n=1}^p (2n + 1) = 483$$

$$3 + 5 + 7 + 9 + \dots + (2p + 1) = 483$$

$$483 = \frac{p}{2} (2(3) + (p - 1)(2))$$

$$483 = \frac{p}{2} (2p + 4)$$

$$0 = p^2 + 2p - 483$$

$$0 = (p + 23)(p - 21)$$

$$p \neq -23 \quad \text{of} \quad p = 21$$

VRAAG 13

(a) (1) $\frac{8!}{3!2!} = 3\,360$

(2) $8 _ _ _ _ _ 5 \frac{6!}{2!}$

$$\text{Waarskynlikheid} = \frac{360}{3\,360} = \frac{3}{28} = 0,11$$

(3) $\frac{9!}{3!2!x} = 15\,120$

$$x = 2!$$

Dus

3, 4 of die 7 kan bygevoeg word.

(b)

		Rooi dobbelsteen							Rooi	Groen	Omtrek < 22
		1	2	3	4	5	6		3	5	J
Groen dobbelsteen	1		2	3	4	5	6		3	6	J
	2	2		6	8	10	12		4	5	J
	3	3	6		12	15	18		4	6	J
	4	4	8	12		20	24		5	3	J
	5	5	10	15	20		30		5	4	J
	6	6	12	18	24	30			5	6	N
									6	3	J
									6	4	J
									6	5	N

Oppervlakteberekeninge Omtrekberekeninge

$$P(\text{Oppervlakte} > 12; \text{Omtrek} < 22 \text{ en nie vierkant nie}) = \frac{8}{36} = 0,22$$

Totaal: 150 punte