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NASIONALE SENIOR CERTIFIKAAT-EKSAMEN
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TEGNIIESE 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.

VRAAG 1

1.1 1.1.1 $2x^2 - 5x = 12$
 $2x^2 - 5x - 12 = 0$
 $(2x + 3)(x - 4) = 0$
 $x = -\frac{3}{2}$ of $x = 4$

1.1.2 $4x + 7 = -2x^2$
 $2x^2 + 4x + 7 = 0$
 $x^2 + 2x + \frac{7}{2} = 0$

OF**Opsie 1**

Gebruik formule

$$x = \frac{-4 \pm \sqrt{16 - 56}}{2}$$

$$= \frac{-4 \pm \sqrt{-40}}{2}$$

$$= \frac{-2 \pm i\sqrt{10}}{2} \text{ (gebruik sakrekenaar)}$$

$$= -1 \pm \frac{\sqrt{10}}{2}i \text{ (punt toegeken as gelaat by *)}$$

Opsie 2

$$(x+1)^2 = 1 - \frac{7}{2} = \frac{-5}{2} = \frac{-10}{4}$$

$$x+1 = \pm \frac{\sqrt{10}i}{2}$$

$$x = -1 \pm \frac{\sqrt{10}i}{2}$$

1.2 Laat energieverbruik van motor = x en verwarmers = y

$$4x + 2y = 25 \text{ ① en } 2x + 3y = 18 \text{ ②}$$

② $\times 2$: $4x + 6y = 36$

Trek af $\frac{4x + 6y = 36}{-4x + 2y = 25}$

$$y = \frac{11}{4} \text{ kJ/h}$$

Vervang ① $4x + \frac{11}{2} = 25$

$$4x = \frac{39}{2}$$

$$x = \frac{39}{8} \text{ kJ/h}$$

1.3 $\Delta = (-3)^2 - 4(1)(9k)$
 $= 9 - 36k$

Vir reële, verskillende wortels $\Delta > 0$

$$9 - 36k > 0$$

$$-36k > -9$$

$$k < \frac{1}{4}$$

VRAAG 2

$$\begin{aligned}
 2.1 \quad & \frac{3^{2014} + 9^{1007}}{27^{671}} \\
 &= \frac{3^{2014} + 3^{2014}}{3^{2013}} \\
 &= \frac{2 \cdot 3^{2014}}{3^{2013}} \\
 &= 2 \cdot 3 = 6
 \end{aligned}
 \quad \text{OF} \quad
 \begin{aligned}
 & \frac{3^{2014}}{3^{2013}} + \frac{3^{2014}}{2^{2013}} \\
 &= 3 + 3 = 6
 \end{aligned}$$

$$\begin{aligned}
 2.2 \quad 2.2.1 \quad & 5 - \sqrt{4x+1} = x \\
 & 5 - x = \sqrt{4x+1} \quad \text{OF} \\
 & 25 - 10x + x^2 = 4x + 1 \\
 & x^2 - 14x + 24 = 0 \\
 & (x-2)(x-12) = 0 \\
 & x = 2 \quad \text{of} \quad x = 12 \\
 & \quad \quad \quad \text{NVT}
 \end{aligned}
 \quad \text{OF} \quad
 \begin{aligned}
 & 5 - x \geq 0 \quad \text{en} \quad 4x + 1 \geq 0 \\
 & -x \geq -5 \quad \text{en} \quad x \geq -\frac{1}{4} \\
 & x \leq 5 \\
 & \text{Kontroleer oplossing}
 \end{aligned}$$

$$\begin{aligned}
 2.2.2 \quad & 2\log x = \log 4 + \log(x-1) \\
 & \log x^2 = \log(4x-4) \quad x > 1 \\
 & x^2 = 4x - 4 \\
 & x^2 - 4x + 4 = 0 \\
 & (x-2)^2 = 0 \\
 & x = 2
 \end{aligned}$$

VRAAG 3

$$\begin{aligned}
 3.1 \quad & \frac{(3-2i)(1-5i)}{(1+5i)(1-5i)} \\
 &= \frac{3-17i+10i^2}{1-25i^2} \\
 &= \frac{3-17i-10}{1+25} \quad (i^2 = -1) \\
 &= \frac{-7-17i}{26} \\
 &= -\frac{7}{26} - \frac{17}{26}i
 \end{aligned}$$

$$3.2 \quad 3.2.1 \quad V = 2(\cos 120^\circ + i \sin 120^\circ) \quad \text{of} \quad 2(-\cos 60^\circ + i \sin 60^\circ)$$

$$\begin{aligned}
 3.2.2 \quad V &= 2\left(-\frac{1}{2} + i\frac{\sqrt{3}}{2}\right) \\
 &= -1 + \sqrt{3}i
 \end{aligned}$$

$$\begin{aligned}
 3.3 \quad & 11001_2 \\
 &= 2^4 + 2^3 + 2^0 \\
 &= 16 + 8 + 1 \\
 &= 25
 \end{aligned}$$

VRAAG 4

$$4.1 \quad = 4\,800 - \left(4\,800 \times \frac{13,5}{100} \right) \quad \text{OF} \quad R4\,800 \times 86,5\%$$

$$= R4\,152 \quad = R4\,152$$

$$4.2 \quad 4.2.1 \quad m = 4$$

$$i = 0,09$$

$$1 + i = \left(1 + \frac{i^{(m)}}{m} \right)^m$$

$$1 + 0,09 = \left(1 + \frac{i^{(4)}}{4} \right)^4$$

$$\sqrt[4]{1,09} = 1 + \frac{i^{(4)}}{4}$$

$$\sqrt[4]{1,09} - 1 = \frac{i^{(4)}}{4}$$

$$4 \left(\sqrt[4]{1,09} - 1 \right) = i^{(4)}$$

$$\therefore i^{(4)} = 8,71\%$$

OF Die nominale rentekoers is 8,71% p.j. kwartaalliks saamgestel

$$4.2.2 \quad \text{Laat bedrag belê} = x$$

$$3x = x(1 + 15i)$$

$$3 = 1 + 15i$$

$$i = \frac{2}{15} = 0,133$$

$$\text{d.w.s. } 13\frac{1}{3}\% \text{ p.j. (of } 13,3\%)$$

$$4.3 \quad \text{Oorspronklike waarde} = x$$

$$\frac{x}{2} = x(1 - 0,13)^n$$

$$0,5 = 0,87^n$$

$$\log_{0,87} 0,5 = n$$

$$n = 4,977 \dots \text{ d.w.s. } 5 \text{ jaar}$$

VRAAG 5

5.1 Vervang $(-2; 5)$ in g : $5 = -(-2) + k$
 $3 = k$

5.2 T is $(0; 3)$ d.w.s. $c = 3$ **OF** $y = -\frac{1}{2}(x+2)^2 + 5$
 $f(x) = -\frac{1}{2}x^2 + bx + 3$ $= -\frac{1}{2}x^2 + 2x - 2 + 5$
 Vervang $(-2; 5)$: $5 = -\frac{1}{2}(-2)^2 + b(-2) + 3$ $= -\frac{1}{2}x^2 - 2x - 3$
 $2b = -4$ $c = 3; b = -2$
 $b = -2$

5.3 $PQ = y_P - y_Q$
 $= (-x + 3) - \left(-\frac{1}{2}x^2 - 2x + 3\right)$
 $= \frac{1}{2}x^2 + x$

5.4 $\frac{1}{2}x^2 + x = 12$
 $x^2 + 2x - 24 = 0$
 $(x+6)(x-4) = 0$
 $x = -6$ of $x = 4$
 P NVT
 Vervang in g : $y_P = -(-6) + 3 = 9$
 P is $(-6; 9)$

5.5 $g(x) \leq f(x)$
 $-2 \leq x \leq 0$ **OF** $[-2; 0]$

VRAAG 6

6.1 $y = 1$

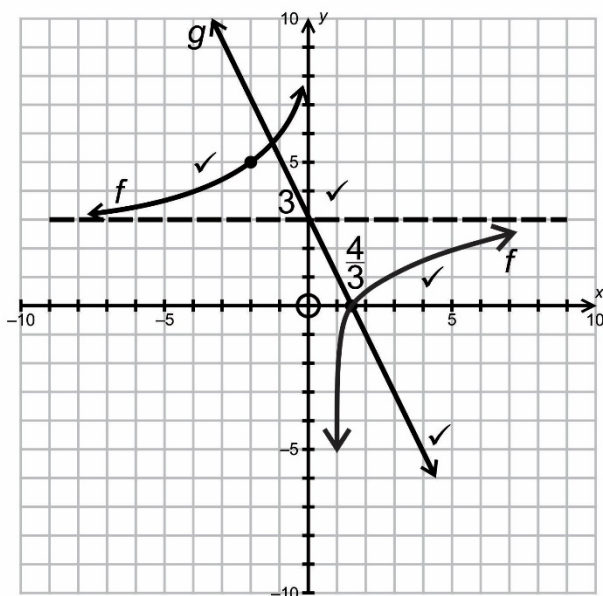
6.2 By B, $x = 0$: $y = 2^0 + 1$
 $= 1 + 1 = 2$
d.w.s. $r = 2$ dus $g(x) = \sqrt{4 - x^2}$

6.3 Definisiegebied: $x \in [-2; 2]$ **OF** $-2 \leq x \leq 2$
Waardegebied: $y \in [0; 2]$ $0 \leq y \leq 2$

6.4 $M_{AB} = \frac{y_A - y_B}{x_A - x_B}$
 $0,44 = \frac{k - 2}{-1,466 - 0}$
 $0,44(-1,466) = k - 2$
 $k \approx 1,35$

VRAAG 7

7.1

'n Asimptoot $y = 3$

$$\text{Laat } y = 0 \quad 0 = -\frac{4}{x} + 3 \Rightarrow x = \frac{4}{3}$$

Punte op grafiek toegeken.

7.2

$$\ln g = \frac{3-0}{0-4} = -\frac{9}{4}$$

Vergelyking van $g: y = -\frac{9}{4}x + 3$

$$\begin{aligned} \therefore h(x) &= -\frac{9}{4}x + 3 + 1 \\ &= -\frac{9}{4}x + 4 \end{aligned}$$

VRAAG 8

$$\begin{aligned}
 8.1 \quad f'(x) &= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} \\
 &= \lim_{h \rightarrow 0} \frac{5 - 2x - 2h - 5 + 2x}{h} \\
 &= \lim_{h \rightarrow 0} \frac{-2h}{h} \\
 &= \lim_{h \rightarrow 0} -2 \\
 &= -2
 \end{aligned}$$

$$\begin{aligned}
 8.2 \quad y &= \frac{x^2}{x} - \frac{4x}{x} + \frac{3}{x} \\
 &= x - 4 + 3x^{-1} \\
 \therefore \frac{dy}{dx} &= 1 - 3x^{-2}
 \end{aligned}$$

OF

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

$$\begin{aligned}
 8.3 \quad f(x) &= 2x^{\frac{1}{2}} + x^{-3} - \sqrt{2}x \\
 f'(x) &= x^{-\frac{1}{2}} - 3x^{-4} - \sqrt{2}
 \end{aligned}$$

OF

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

VRAAG 9

9.1 9.1.1 (a) $\text{Vol} = \pi r^2 h$
 $375 = \pi r^2 h$
 $\frac{375}{\pi r^2} = h$

(b) $\text{SA} = 2\pi r^2 + 2\pi rh$
 $= 2\pi r^2 + \frac{2\pi r \cdot 375}{\pi r^2}$
 $= 2\pi r^2 + \frac{750}{r}$

9.1.2 $S = 750r^{-1} + 2\pi r^2$
 $\frac{ds}{dr} = -750r^{-2} + 4\pi r$

By min $\frac{ds}{dr} = 0$

$\frac{-750}{r^2} + 4\pi r = 0$

$-750 + 4\pi r^3 = 0$

$r^3 = \frac{750}{4\pi} = \frac{375}{2\pi}$

$r = \sqrt[3]{\frac{375}{2\pi}} \text{ cm} \quad \text{OF} \quad 5\sqrt[3]{\frac{3}{2\pi}} \text{ OF aanvaar } 3,9 \text{ of } \frac{7,5}{\pi}$

9.2 9.2.1 $f(x) = (x+2)(x-3)^2$
 $= (x+2)(x^2 - 6x + 9)$
 $= x^3 - 6x^2 + 9x + 2x^2 + 2x + 18$
 $= x^3 - 4x^2 - 3x + 18$
 $p = -4 \quad q = 18$

OF deur vervanging

$0 = (-2)^3 + p(-2)^2 - 3(-2) + q$

en

$0 = (3)^3 + p(3)^2 - 3(3) + q$

en los op vir p en q

9.2.2 $mtan = f'(x) = 3x^2 - 8x - 3$

By A, $3x^2 - 8x - 3 = 8$

$3x^2 - 8x - 11 = 0$

$(3x-11)(x+1) = 0$

$x = \frac{11}{3}$ of $x_A = -1$

$y_A = (-1+2)(-1-3)^2$
 $= 16$

OF

vervang in vergelyking

$A(-1; 16)$

$$9.2.3 \quad f(x) = x^3 - 4x^2 - 3x + 18$$

$$f'(x) = 0 \quad (\text{draaipunt})$$

$$\therefore 3x^2 - 8x - 3 = 0$$

$$(3x+1)(x-3) = 0$$

$$\therefore x = -\frac{1}{3} \quad \text{of} \quad x = 3$$

$$\text{Draaipunte} \left(-\frac{1}{3}; \frac{500}{27} \right); (3; 0)$$

$$9.2.4 \quad \text{By K, } m_{\text{tan}} = f'(0) = -3$$

$$\therefore m_{\perp} = \frac{1}{3}$$

$$\text{K is } (0; 18)$$

$$\therefore h(x) = \frac{1}{3}x + 18$$

$$9.3 \quad 9.3.1 \quad A = -t^2 + 5t + 8$$

$$A = -(0)^2 + 5(0) + 8$$

$$= 8 \text{ cm}^2$$

$$9.3.2 \quad \frac{dA}{dt} = -2t + 5$$

$$\text{by } t = 2$$

$$= -2(2) + 5$$

$$= 1 \text{ cm}^2$$

$$9.3.3 \quad \frac{dA}{dt} = 0$$

$$-2t + 5 = 0$$

$$t = \frac{5}{2} \text{ sekondes}$$

VRAAG 10

10.1 (a) $\int 0 dx = c$

(b) $\int dx = x + c$

10.2 Bepaal: $\int \left(3x^2 + \frac{1}{x} \right) dx$

$$= \frac{3x^3}{3} + \ln x + c$$

$$= x^3 \ln x + c$$

10.3 Oppervlakte $= \int_0^2 x^3 dx$

$$= \left[\frac{x^4}{4} \right]_0^2$$

$$= \frac{16}{4} - 0$$

$$= 4$$

en deur simmetrie $\int_{-2}^0 x^3 dx = 4$

$\therefore$ Totale oppervlakte = 8 eenhede²

OF

$$\int_{-2}^0 x^3 dx = \left[\frac{x^4}{4} \right]_{-2}^0$$

$$= -4$$

$$\therefore 8 \text{ eenhede}^2$$

Totaal: 150 punte