NASIONALE SENIOR SERTIFIKAAT-EKSAMEN
NOVEMBER 2020

TEGNIESE WISKUNDE: VRAESTEL II

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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VRAAG 1

1.1 $m_{AB} = \frac{y_B - y_A}{x_B - x_A}$

$mm_{AB} = \frac{17-5}{12-3} = \frac{4}{3}$ ✓a vervang in korrekte formule

✓ca vereenvoudiging (2)

1.2 $m_{AB} \times m_{BC} = -1$

$\frac{4}{3} \times m_{BC} = -1$

$m_{BC} = \frac{-3}{4}$ ✓ca vereenvoudiging

$m_{BC} = \frac{y_B - y_C}{x_B - x_C} = \frac{-3}{4}$

$\frac{17-20}{12-k} = \frac{-3}{4}$ ✓a vervang in korrekte formule

$4(17-20) = -3(12-k)$ ✓ca vereenvoudig

$-12 = -3(12-k)$

$4 = 12-k$

$k = 8$ ✓ca vereenvoudiging (4)

1.3 $AB = \sqrt{(x_B - x_A)^2 + (y_B - y_A)^2}$

$= \sqrt{(12-3)^2 + (17-5)^2}$ ✓a vervang in korrekte formule

$= \sqrt{225}$

$= 15$ eenhede ✓ca antwoord

$AB^2 + BC^2 = AC^2$ (Pythagoras)

$(15)^2 + (5)^2 = AC^2$ ✓a vervang in korrekte formule

$AC^2 = 250$

$AC = 5\sqrt{10}$ ✓ca vereenvoudiging

Omtrek $= 15 + 5 + 5\sqrt{10} = 20 + 5\sqrt{10}$ ✓✓ca antwoord (6)

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VRAAG 2

2.1 2.1.1 $r^2 = x^2 + y^2$

$r^2 = 8^2 + 4^2$

$r^2 = 80$ ✓

$\therefore x^2 + y^2 = 80$ ✓ (2)

2.1.2 A(–8; –4) ✓✓ (2)

2.1.3 A(–8; –4) B(8; 4)

$m_{AB} = \frac{y_A - y_B}{x_A - x_B} = \frac{-4-4}{-8-8} = \frac{1}{2}$ ✓

$\therefore y = \frac{1}{2}x$ ✓ (2)

2.1.4 $m_{PT} \times m_{AQ} = -1 \qquad (\text{raaklyn} \perp \text{radius})$

$\therefore m_{PT} = -2$ ✓

$tan\theta = -2$ ✓

$\theta = 180° - 63,43° = 116,57°$ ✓ (3)

2.1.5

$y = -2x + c$	**OF**	$y - y_1 = m(x - x_1)$
$-4 = -2(-8) + c$ ✓		$y + 4 = -2(x - 8)$ ✓✓
$c = -20$ ✓		$y = -2x - 20$ ✓
$\therefore y = -2x - 20$ ✓		

(3)

2.1.6

$y = -2x + -20$		m(AT) = –2
$-10 = -2t + -20$ ✓	**OF**	$\frac{-4+10}{-8-t} = -2$
$t = -5$ ✓		16 + 2t = 6
		2t = –10
		t = –5

(2)

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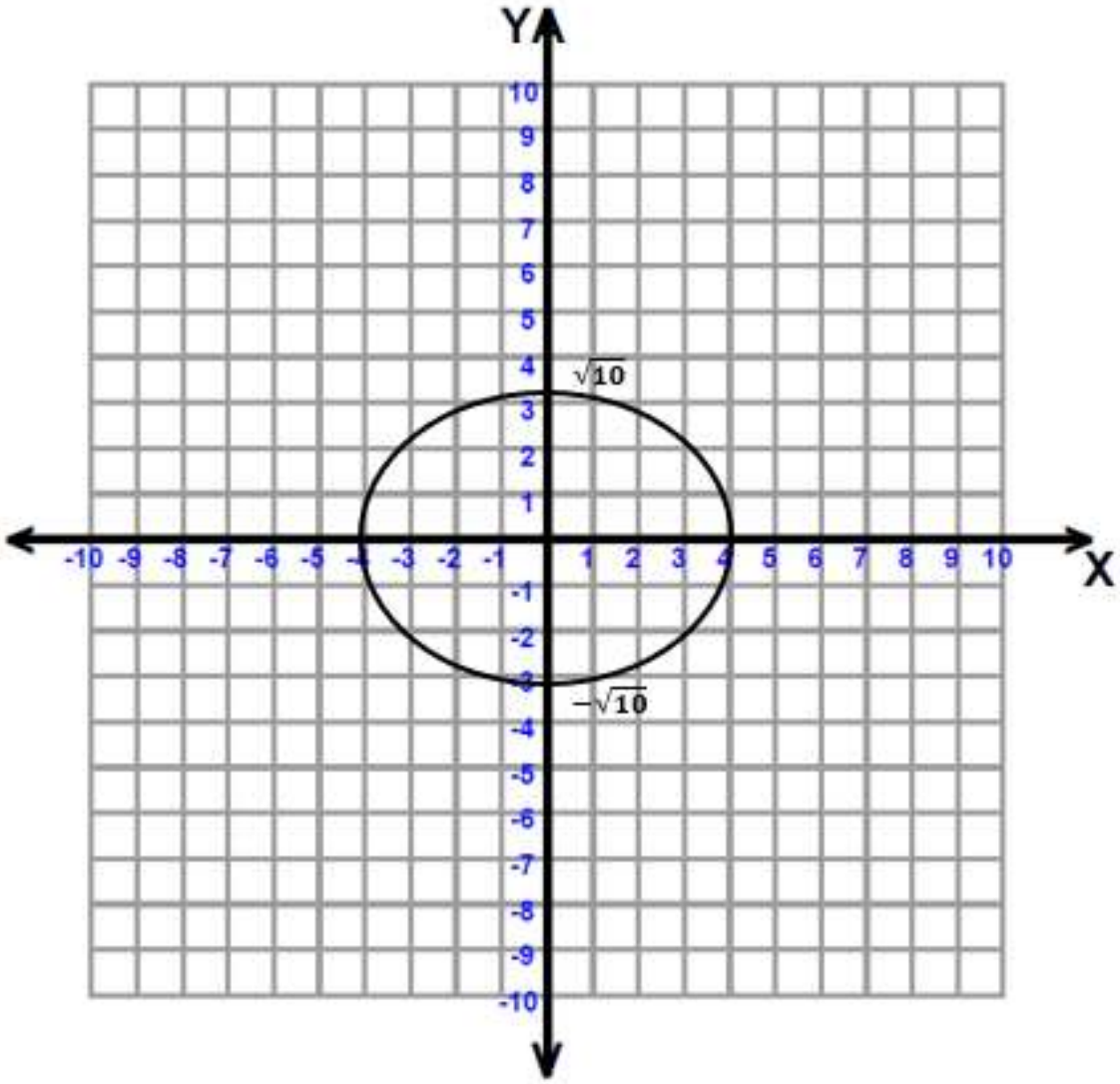
2.2 Skets die grafiek gedefinieer deur $\frac{x2}{16}+\frac{y2}{10}=1$.

Toon AL die afsnitte met die asse duidelik.



✓ x-afsnitte by 4 en –4

✓ y-afsnitte by $\sqrt{10}$ en $-\sqrt{10}$

✓ vorm (3)

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VRAAG 3

3.1 3.1.1 $= 6\left(\frac{4}{2\sqrt{13}}\right)$ ✓ $-3\left(\frac{4}{6}\right)$ ✓

$= \frac{-26+12\sqrt{13}}{13}$ ✓

$x^2 + y^2 = r^2$

$6^2 + 4^2 = AO^2$

$52 = AO^2$

$\therefore\ AO = 2\sqrt{13}$ ✓ (4)

3.1.2 $= \left(\frac{2\sqrt{13}}{4}\right)^2$ ✓

$= \frac{13}{16}$ ✓ (2)

3.2 3.2.1 $= \text{cosec}\left(\frac{\pi}{3} - \frac{\pi}{6}\right)$

$= \text{cosec}\left(\frac{\pi}{6}\right)$ ✓

$= \frac{1}{\sin\left(\frac{\pi}{6}\right)}$

$= 2$ ✓ (2)

3.2.2 $= 2\cot\left(\frac{\pi}{6}\right)$ ✓

$= \frac{2}{tan\frac{\pi}{6}}$

$= \frac{2}{\frac{1}{\sqrt{3}}}$ ✓

$= 2\sqrt{3}$ OF $\approx 3{,}5$ (2)

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3.3 3.3.1 $124,66° \times \frac{\pi}{180°} \approx 2,18$ radiale ✓

$57,46° \times \frac{\pi}{180°} \approx 1$ radiaal ✓ (2)

3.3.2 $sec(2,18+1)$

$= sec(3,18)$

$= \frac{1}{cos(3,18)}$

$\approx -1,0$ ✓ (1)

3.4 $\tan(180° - \alpha).\cos\alpha.\sin(180° + \alpha) + cos^2(360° + \alpha)$

$= (-\tan\alpha)$ ✓ $(cos\alpha)$ $(-\sin\alpha)$ ✓ $+cos^2\alpha$ ✓

$= (-\sin\alpha)(-\sin\alpha) + cos^2\alpha$ ✓

$= \sin^2\alpha + cos^2\alpha$ ✓

$= 1$ ✓ (6)

3.5 $\tan(x - 15°) = -1$

$\therefore (x - 15°)$ ✓ $= 180° - 45°$ [verwysingshoek ✓ $(x - 15°)$]

$\therefore x = 150°$ ✓ (3)

3.6 LK: $sin^2A + tan^2A + cos^2A$ RK : $\sec^2 A$

$= 1$ ✓ $+ tan^2A$

$= sec^2A$ ✓

= RK (2)

3.7 3.7.1 a = 3; ✓ b = 1; ✓ c = 0; ✓ d = 2 ✓ (4)

3.7.2 Periodisiteit = $\frac{360°}{3}$ ✓

Periodisiteit = 120° ✓

(2)

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VRAAG 4

4.1 4.1.1 $\frac{30m}{\sin 65°}$ ✓ = $\frac{AB}{\sin 50°}$ ✓

$\frac{30\sin 50°}{\sin 65°} = AB$ ✓

$AB \approx 25,36\ m$ ✓ (4)

4.1.2 $\cos 25° \checkmark = \frac{AD}{AB}$

$\cos 25° = \frac{AD}{25.36m}$ ✓

$25,36 \times \cos 25° = AD$

$AD \approx 22,98\ m$ ✓

OF

$\frac{AD}{\sin 65°}$ ✓ = $\frac{25,36}{\sin 90°}$ ✓

$AD = \frac{25,36 \times \sin 65°}{\sin 90°}$

$AD \approx 22,98\ m$ ✓ (3)

4.2 4.2.1 $AC^2 = AB^2 + CB^2 - 2AB.CB.\cos 60°$ ✓

$AC^2 = (680\ m)^2 + (420\ m)^2 - 2(680\ m)(420\ m)\cos 60°$ ✓

$AC^2 = 353200$ ✓

$AC \approx 594\ m$ ✓ (4)

4.2.2 120° ✓ (1)

4.2.3 $\frac{AD}{\sin 41°} = \frac{594\ m}{\sin 120°}$ ✓

$\therefore AD = \frac{594 \times \sin 41°}{\sin 120°}$ ✓

$AD \approx 450\ m$ ✓ (3)

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VRAAG 5

5.1 In $\Delta ABC: AC^2 = AB^2 + BC^2$ (Pythagoras)

$AC^2 = (230)^2 + (230)^2$ ✓

$AC = 230\sqrt{2}$ ✓ **OF** $\therefore AC = 325,269\ldots$

$\therefore MC = \frac{230\sqrt{2}}{2}$ **OF** $\therefore MC = \frac{325,269}{2}$

$\therefore MC = 115\sqrt{2}$ ✓ **OF** $\therefore MC = 162,63$ (3)

5.2 $\cos M\hat{C}T = \frac{MC}{TC}$ ✓

$\cos M\hat{C}T = \frac{115\sqrt{2}\text{ m}}{218\text{ m}}$ ✓

$\therefore \cos M\hat{C}T = 0,746$

$\therefore M\hat{C}T \approx 41,75°$ ✓ (3)

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VRAAG 6

6.1 6.1.1 $\hat{H}_1 = \hat{F}_1 = 23°$ ✓ (hoeke in dieselfde segment) ✓

$\hat{F}_1 + \hat{F}_2 = \hat{E}_3 = 50°$ (gelyke hoeke teenoor gelyke sye; radii) ✓

$\therefore 23° + a = 50°$

$a = 27°$ ✓ (4)

6.1.2 $\hat{E}_1 = \hat{F}_2 + \hat{F}_3$ (hoeke in dieselfde segment) ✓

$49° = 27° + b$

$22° = b$ ✓ (2)

6.2 6.2.1 $\hat{B}_2 + \hat{F} = 180°$ (teenoorstaande hoeke van koordevierhoek) ✓

$\hat{B}_2 + 35° = 180°$

$\therefore\ \hat{B}_2 = 145°$ ✓ (2)

6.2.2 $\hat{E}_1 = 2 \times \hat{F}$ (hoek by middelpunt = 2 × hoek by omtrek) ✓

$\hat{E}_1 = 2 \times 35° = 70°$ ✓ (2)

6.2.3 $\hat{E}_1 + \hat{C}_3 + \hat{D}_2 = 180°$ (binnehoeke van driehoek CED) ✓

$70° + \hat{C}_3 + \hat{D}_2 = 180°$

$\hat{C}_3 = \hat{D}_2$ (gelyke hoeke by gelyke sye; radii) ✓

$\therefore \hat{C}_3 = \hat{D}_2 = 55°$ ✓ (3)

6.2.4 $2\ \hat{A} = \hat{B}_2$ (hoek by middelpunt = 2 x hoek by omtrek) ✓

$2\ \hat{A} = 145°$

$\therefore\ \hat{A} = 72{,}5°$ ✓ (2)

6.2.5 $\hat{A} = \hat{C}_1 = 72{,}5°$ (gelyke hoeke by gelyke sye; radii)

$\hat{C}_1 + \hat{C}_2 = 90°$ (hoek in halfsirkel) ✓

$\therefore\ \hat{C}_2 = 17{,}5°$ ✓ (3)

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6.3 6.3.1 $\hat{A}_1 = \hat{C}_1$ ✓ (hoeke teenoor gelyke sye, gegee AD = DC) ✓

$\therefore\ \hat{A}_1 = 37,2°$ ✓ (2)

6.3.2 $\hat{A}_1 = \hat{C}$ (hoeke teenoor gelyke sye, gegee AD = DC) ✓

$\hat{A}_1 = \hat{B}_1 = 37,2°$ ✓ (raaklyn-koord-stelling) ✓

$\hat{B}_2 = 90° - 37,2°$ ✓ (hoek in halfsirkel)

$\therefore\ \hat{B}_2 = 52,8°$ ✓ (4)

6.3.3 $A\hat{B}E = 90°$ (hoek in halfsirkel) ✓

$AE^2 = BE^2 + AB^2$ (Pythagoras)

$(13)^2 = (3,5)^2 + AB^2$ ✓

$\therefore AB = 12,52$ cm ✓ (3)

6.4 6.4.1 $\frac{PB}{BR} = \frac{PC}{CA} = \frac{1}{2}$ ✓ (Eweredigheidstelling, CB // AR)

$\frac{PA}{PQ} = \frac{PC + CA}{PC + CA + AQ}$ ✓

$\frac{3}{8} = \frac{1+2}{1+2+5}$ ✓

$\therefore \frac{BD}{BQ} = \frac{CA}{CQ}$ ✓

$= \frac{2}{5}$ ✓ (5)

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6.4.2 $$\frac{\text{Oppervlakte van } \Delta PRA}{\text{Oppervlakte van } \Delta QRA}$$

$$= \frac{0,5 \times PA \times \text{hoogte}}{0,5 \times QA \times \text{hoogte}} \checkmark$$

$$= \frac{PA}{QA}$$

$$= \frac{3}{5} \checkmark$$ (2)

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VRAAG 7

7.1 $\text{Oppervlakte van sektor} = \frac{rs}{2} = \frac{r^2\theta}{2}$, ✓

r = radius, s = booglengte en θ = middelpunthoek in radiale

$$\text{Oppervlakte} = \frac{(9\text{ cm})^2\left(80° \times \frac{\pi}{180°}\right)}{2} \checkmark$$

$\text{Area} = 18\pi\text{ cm}^2$ ✓

Oppervlakte van driehoek AOC $= \frac{1}{2} \times AO \times OC \times sin80°$

$$\therefore \text{Oppervlakte} = \frac{1}{2} \times 9\,cm \times 9\,cm \times sin80° \checkmark$$

$$\therefore \text{Oppervlakte} = 39{,}884714\,cm^2 \checkmark$$

Oppervlakte van gearseerde segment $= 18\pi\,cm^2 - 39{,}884714\,cm^2$

$\approx$ 16,7 cm^2 ✓ (6)

7.2 7.2.1 $v = \pi Dn$

$v = \pi(0{,}15)(4{,}2)$ ✓✓

$v = 1{,}98\text{ m/s}$ ✓✓ (4)

7.2.2 $\omega = 2\pi n$ ✓

$\omega = 2\pi(4{,}2)$ ✓

$\omega = 8{,}4\pi\ rad/s$ ✓ (3)

7.2.3 (a) $s_1 = r\theta$

$s_1 = (7{,}5)\left(160° \times \frac{\pi}{180°}\right)$ ✓

$s_1 \approx 21cm$ ✓ (2)

(b) $s_2 = r\theta$

$s_2 = (15)\left(200° \times \frac{\pi}{180°}\right)$ ✓

$s_2 \approx 52{,}4\,cm$ ✓ (2)

(c) $(52,5)^2 = (7,5)^2 + AB^2$ ✓

$CD = AB \approx 52$ cm ✓

Totale lengte = (51,96 + 51,96 + 20,94 + 52,36) cm ✓

$\approx 177,3$ cm ✓ (4)

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VRAAG 8

8.1 Hemisfeer: $Volume = \frac{4}{3}\pi r^3 \div 2$

$Volume = \frac{4}{3}\pi(20)^3 \div 2$ ✓

$= 16\,755{,}16\ m^3$ ✓

Silinder Volume $= \pi r^2 \times h$

$= \pi(20)^2 \times 8$ ✓

$= 10\,053{,}1\ m^3$ ✓

Volume in een tenk = 16 755,16 m^3 + 10 053,1 m^3

= 26 808,26 m^3 ✓

Totale volume brandstof wat tenker in die 4 tenks kan vervoer = 4(26 808,26 m^3)

= 107233,04 m^3 ✓

(6)

8.2 8.2.1 $a = 120\ m \div 6 = 20\ m$

Oppervlakte $= a(m_1 + m_2 + m_3 + m_4 + m_5)$ ✓

$= 20\left(\frac{12+15}{2} + \frac{15+16}{2} + \frac{16+17}{2} + \frac{17+17}{2} + \frac{17+16}{2} + \frac{16+12}{2}\right)$ ✓

$= 20(13{,}5 + 15{,}5 + 16{,}5 + 17 + 16{,}5 + 14)$ ✓

$= 1860\ m^2$ ✓ (4)

8.2.2 Volume = 1 860 m^2× 210 m✓

= 390 600 m^3 ✓ (2)

8.2.3 Volume vir 1 m diep = 120 m × 210 m × 1 m ✓

= 25 200 m^3 ✓

1 m^3 = 1 000 liter

25 200 m^3 = 25 200 000 liter ✓ (3)

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Totaal: 150 punte

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