

EXAMINATION		NATIONAL SENIOR CERTIFICATE	
GRADE		12	
DATE		NOVEMBER 2025	
SUBJECT		MATHEMATICS	
PAPER		1	
MARK TOTAL		150	
DURATION (HOURS)		3	
NUMBER OF PAGES		10	



SOUTH AFRICAN COMPREHENSIVE ASSESSMENT INSTITUTE
SUID-AFRIKAANSE KOMPREENSIEWE ASSESSERINGSINSTITUUT



INSTRUCTIONS

Read the following instructions carefully before answering the questions.

1. This paper consists of 9 questions. Answer all the questions.
2. Clearly show **ALL** calculations, diagrams, graphs etc. that you have used in determining your answers.
3. Answers only will not necessarily be awarded full marks.
4. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
5. Round off answers to **TWO** decimal places where necessary, unless otherwise stated.
6. Diagrams are not necessarily drawn to scale.
7. An information sheet with formulae is included at the end of the question paper.
8. Write neatly and legibly, in **BLUE** ink only.

QUESTION 11.1 Solve for x :

1.1.1 $x^2 - 8x - 9 = 0$ (2)

1.1.2 $1 + 7x + 4x^2 = 0$
(Give the answer correct to two decimal places) (3)

1.1.3 $\frac{(x-5)^2}{x-2} \leq 0$ (3)

1.2 Solve for x and y simultaneously:

$y - x + 2 = 0$ and $x^2 - 3xy + y^2 + 4 = 0$ (7)

1.3 Solve for x :

$$\left(\frac{1}{4}\right)^{(x-\cos 60^\circ)} = 0,125^{(2x)}$$
 (4)

1.4 The roots of a quadratic equation are given by:

$$x = \frac{-3 \pm \sqrt{16 + h}}{2}$$

1.4.1 For which value of h will 0 (zero) be one of the roots? (3)1.4.2 If $h = 9$ determine the roots. (2)

1.5 Show that: $\frac{\sqrt{x}}{x} + \frac{y}{\sqrt{x}} = \frac{\sqrt{x}(1+y)}{x}$ (3)

[27]



QUESTION 2

- 2.1 The following arithmetic sequence is given: 2; 9; 16;
Calculate the 100th term in this sequence. (3)
- 2.2 Evaluate the following arithmetic series: $1 - 1 - 3 - \dots - 193$. (4)
- 2.3 The sum of an infinite, converging geometric series, is 10.
The sum to infinity of the odd numbered terms of the same series is $\frac{25}{3}$. Determine the first term of this series. (6)

[13]

QUESTION 3

- 3.1 Solve for $x \in \mathbb{N}$ if:

$$\sum_{k=1}^x \frac{1}{3}(2^{k-1}) > 84 \quad (4)$$

- 3.2 A train traveling between two cities stops at various stations. The table below shows the number of passengers on the train at each stop:

	STOP 1	STOP 2	STOP 3	STOP 4
Number of passengers	7	28	43	52

The number of passengers on the train forms a quadratic sequence,
 $T_n = an^2 + bn + c$.

- 3.2.1 Determine the values of a, b and c . (3)
- 3.2.2 If $T_n = -3n^2 + 30n - 20$, calculate the maximum number of passengers on the train. (3)
- 3.2.3 Why does the formula for this quadratic sequence not work at the 10th stop? (2)

[12]

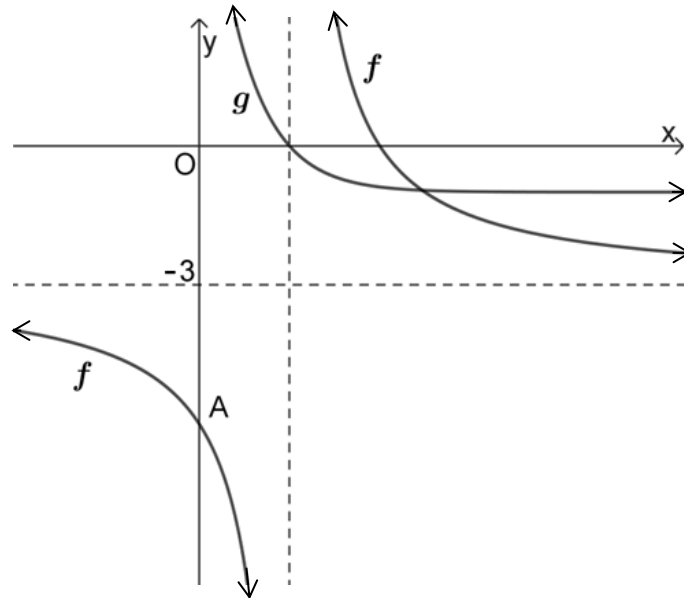
**QUESTION 4**

- 4.1 A savings account at a bank offers an interest of 8,619% p.a. compounded quarterly. Calculate the effective yearly rate. (3)
- 4.2 John decides to purchase a house for R2500000.
- 4.2.1 He obtains a loan from the bank with an interest rate of 12% per annum, compounded monthly.
He will begin repaying the loan one month after it is granted.
His monthly payment on the loan is R26330 p.m.
Calculate the number of months required to pay off the loan. (4)
- 4.2.2 Calculate the outstanding balance of the loan after 20 years, directly after the 240th payment. (4)
- 4.3 A woman started working at the beginning of 2010. She saved R500 at the end of each month. She received an interest rate of 9% p.a., compounded monthly. At the beginning of 2015 the interest rate changed to 9,6% p.a., compounded monthly. Calculate how much money she will have in the account at the beginning of 2020. (4)

[15]

QUESTION 5

The sketch below shows the graphs of the functions $f(x) = \frac{a}{x-p} + q$ and $g(x) = 3^{-x+2} - 1$.



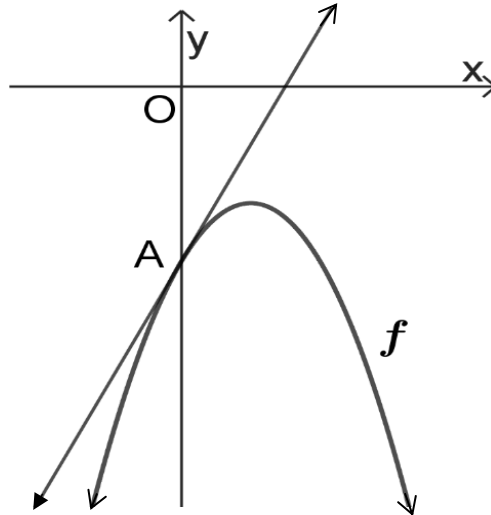
- 5.1 Determine the x -intercept of g . (3)
- 5.2 The horizontal asymptote of f is the line $y = -3$.
The y -intercept of f is the point $A(0; -6)$.
Determine the values of a, p and q . (4)
- 5.3 If $f(x) = \frac{6}{x-2} - 3$, determine the x -intercept of f . (3)
- 5.4 Use the graphs to determine the values of $x \in [2; \infty)$ for which $f(x) \cdot g(x) \leq 0$. (2)
- 5.5 The function $h(x) = 3^{-x}$ is formed by transformations on $g(x) = 3^{-x+2} - 1$.
Describe the transformations on g to become h . (2)
- 5.6 Determine the inverse function of $h(x) = 3^{-x}$ and give it in the form $h^{-1}(x) = \dots$. (2)

[16]



QUESTION 6

- 6.1 The sketch below shows the graph of the function $f(x) = -(x - 1)^2 - 2$.
 The point A is the y -intercept of f .
 A tangent is drawn to the graph of f at $A(0; -3)$.



- 6.1.1 Write down the coordinates of the turning point of f . (2)
- 6.1.2 Determine the y -intercept of f . (2)
- 6.1.3 Calculate the x -intercept of the tangent. (6)
- 6.1.4 The graph of $g(x) = f(x) + k$ is formed by translating the graph of f . This graph, $y = g(x)$, has two positive x -intercepts. Determine the possible values of k . (3)
- 6.2 6.2.1 Given $f(x) = -\sqrt{x}, x \geq 0$. Determine the equation of the inverse function of f in the form $f^{-1}(x) = \dots$ (2)
- 6.2.2 Give the domain and the range of $y = f^{-1}(x)$. (2)
- 6.2.3 Sketch the graph of $y = f^{-1}(x)$ (2)

[19]



QUESTION 7

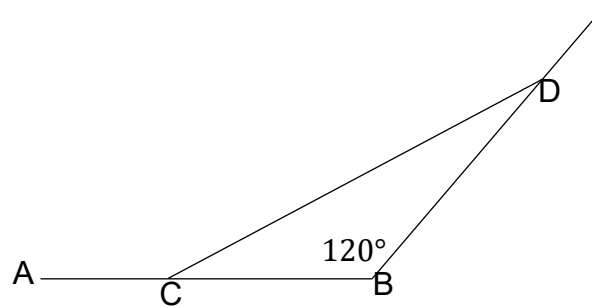
7.1 If $f(x) = 2x^2 - 7x$, determine the derivative $f'(x)$ from first principles. (5)

7.2 Differentiate the following functions:

7.2.1 $f(x) = 5x^4 - \pi$ (2)

7.2.2 $g(x) = (3x - 2)(\sqrt{x} + 1)$ (4)

7.3 The sketch below shows a straight road AB of 12 km. A man starts jogging at a speed of 8 km/h from A to B. At the same time, a woman starts jogging at a speed of 8 km/h on another straight road starting at B. This road makes an angle of 120° with road AB. After a time of t hours the man is at C and the woman at D.



7.3.1 How long after they started jogging will the distance CD between the man and woman be a minimum? (6)

7.3.2 Determine this minimum distance CD. (1)

[18]

QUESTION 8

Given $g(x) = -x^3 + 3x^2 - 4$

8.1 It is given that $g(-1) = 0$. Calculate all the x -intercepts of g . (4)

8.2 Determine the coordinates of the turning points of g . (4)

8.3 Sketch the graph of g on a set of axes. Clearly show all intercepts with the axes as well as the turning points. (3)

8.4 Determine another x -value of g where the gradient of g is equal to the gradient of a tangent drawn at $x = -1$ (6)

[17]

QUESTION 9

9.1 If two events are mutually exclusive, will they also always be complimentary? (1)

9.2 The probability of getting an A for English in a test is $3x$.
The probability of not getting an A for English is $4x^2$.
Calculate the probability that you will get an A in your next English test. (5)

9.3 Children are chosen from a class of 12 girls and 8 boys to sit on chairs numbered 1 to 5. Order matters.

9.3.1 Determine the number of ways in which this can happen if there are no restrictions between boys and girls. (3)

9.3.2 What is the probability that 3 girls and 2 boys will be chosen? (4)

[13]

GRAND TOTAL: [150]



INFORMATION SHEET: MATHEMATICS

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

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

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

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; \quad r \neq 1$$

$$S_\infty = \frac{a}{1 - r}; \quad -1 < r < 1$$

$$F = \frac{x[(1 + i)^n - 1]}{i}$$

$$P = \frac{x[1 - (1 + i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2\sin^2 \alpha \\ 2\cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2 \sin \alpha \cdot \cos \alpha$$

$$\bar{x} = \frac{\sum fx}{n}$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

EKSAMEN		NASIONALE SENIOR SERTIFIKAAT	
GRAAD		12	
DATUM		NOVEMBER 2025	
VAK		WISKUNDE	
VRAESTEL		1	
PUNTETOTAAL		150	
TYDSDUUR (UUR)		3	
AANTAL BLADSYE		10	



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INSTRUKSIES EN INLIGTING

Lees die volgende instruksies deeglik voordat die vraestel beantwoord word.

1. Hierdie vraestel bestaan uit 9 vrae. Beantwoord al die vrae.
2. Toon **ALLE** noodsaaklike berekeninge, diagramme, grafieke ens. wat jy gebruik het om jou antwoord ty kry duidelik aan by elke vraag.
3. Die korrekte antwoord op sigself sal nie noodwendig tot volpunte lei nie.
4. Nie-programmeerbare sakrekenaars mag gebruik word, tensy anders vermeld by 'n spesifieke vraag.
5. Tensy anders gespesifiseer, moet alle antwoorde, waar van toepassing, korrek tot **TWEE** desimale syfers afgerond word.
6. Die diagramme in die vraestel is nie noodwendig volgens skaal geteken nie.
7. 'n Formule blad met formules is ingesluit aan die einde van die vraestel.
8. Skryf netjies en leesbaar, slegs in **BLOU** ink.

VRAAG 1

1.1 Los op vir x :

1.1.1 $x^2 - 8x - 9 = 0$ (2)

1.1.2 $1 + 7x + 4x^2 = 0$
(Gee die antwoord korrek tot twee desimale syfers) (3)

1.1.3 $\frac{(x-5)^2}{x-2} \leq 0$ (3)

1.2 Los op vir x en y gelyktydig:

$y - x + 2 = 0$ en $x^2 - 3xy + y^2 + 4 = 0$ (7)

1.3 Los op vir x :

$$\left(\frac{1}{4}\right)^{(x - \cos 60^\circ)} = 0,125^{(2x)} \quad (4)$$

1.4 Die wortels van 'n kwadratiese vergelyking word gegee deur:

$$x = \frac{-3 \pm \sqrt{16 + h}}{2}$$

1.4.1 Vir watter waarde van h sal 0 (nul) een van die wortels wees? (3)

1.4.2 As $h = 9$ bepaal die wortels. (2)

1.5 Toon aan dat: $\frac{\sqrt{x}}{x} + \frac{y}{\sqrt{x}} = \frac{\sqrt{x}(1+y)}{x}$ (3)

[27]



VRAAG 2

- 2.1 Die volgende rekenkundige ry is gegee: 2; 9; 16;
Bereken die 100^{ste} term in hierdie ry. (3)
- 2.2 Evalueer die volgende rekenkundige reeks: $1 - 1 - 3 - \dots - 193$. (4)
- 2.3 Die som van 'n oneindige konvergerende meetkundige reeks is 10.
Die som tot oneindig van die onewe genummerde terme van dieselfde reeks is $\frac{25}{3}$. Bepaal die eerste term van hierdie reeks. (6)

[13]

VRAAG 3

- 3.1 Los op vir $x \in \mathbb{N}$ as:

$$\sum_{k=1}^x \frac{1}{3}(2^{k-1}) > 84 \quad (4)$$

- 3.2 A trein wat tussen twee stede ry, stop by verskeie stasies. Die tabel hieronder toon die aantal passasiers op die trein na elke stop:

	STOP 1	STOP 2	STOP 3	STOP 4
Aantal passasiers	7	28	43	52

Die aantal passasiers op die trein vorm 'n kwadratiese ry,
 $T_n = an^2 + bn + c$.

- 3.2.1 Bepaal die waardes van a , b en c . (3)
- 3.2.2 As $T_n = -3n^2 + 30n - 20$, bereken die maksimum aantal passasiers op die trein. (3)
- 3.2.3 Hoekom werk die formule vir hierdie kwadratiese ry nie by die 10^{de} stop nie? (2)

[12]

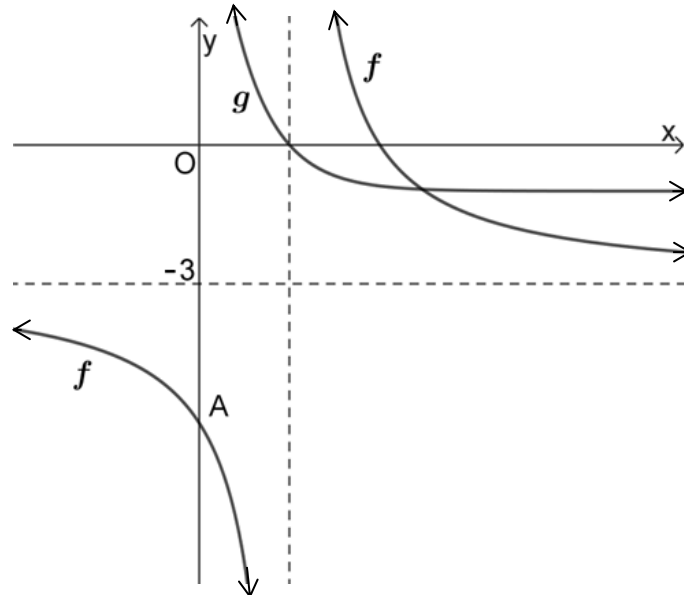
**VRAAG 4**

- 4.1 'n Spaar rekening by 'n bank bied 'n rentekoers van 8,619% p.j. kwartaalliks saamgestel. Bereken die effektiewe jaarlikse koers. (3)
- 4.2 John besluit om 'n huis te koop vir R2500000.
- 4.2.1 Hy verkry 'n lening van die bank met 'n rentekoers van 12% per jaar, maandeliks saamgestel.
Hy wil die lening begin terugbetaal een maand nadat dit toegestaan is.
Sy maandelikse paaieimente op die huis is R26330 p.m.
Bereken die aantal maande wat dit sal neem om die lening af te betaal. (4)
- 4.2.2 Bereken die uitstaande balans van die lening na 20 jaar, direk na die 240^{ste} paaieiment. (4)
- 4.3 'n Vrou het aan die begin van 2010 begin werk. Sy spaar R500 aan die einde van elke maand. Sy ontvang 'n rentekoers van 9% p.j., maandeliks saamgestel. Teen die begin van 2015 verander die rentekoers na 9,6% p.j., maandeliks saamgestel. Bereken hoeveel geld sy in die rekening sal hê aan die begin van 2020. (4)

[15]

VRAAG 5

Die skets hieronder toon die grafieke van die funksies $f(x) = \frac{a}{x-p} + q$ en $g(x) = 3^{-x+2} - 1$.

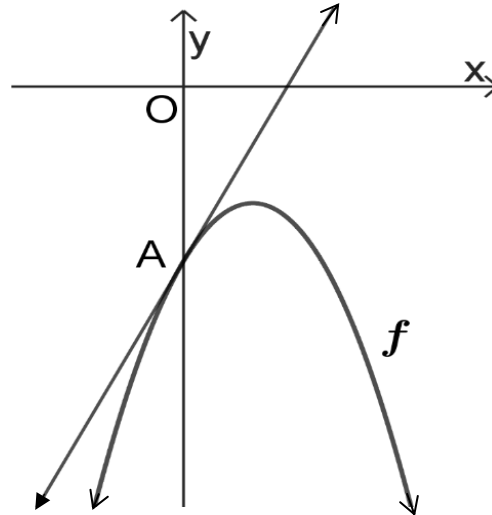


- 5.1 Bepaal die x -afsnit van g . (3)
- 5.2 Die horisontale asimptoot van f is die lyn $y = -3$.
Die y -afsnit van f is die punt $A(0; -6)$.
Bepaal die waardes van a, p en q . (4)
- 5.3 As $f(x) = \frac{6}{x-2} - 3$, bepaal die x -afsnit van f . (3)
- 5.4 Gebruik die grafieke en bepaal die waardes van $x \in [2; \infty)$ waarvoor $f(x) \cdot g(x) \leq 0$. (2)
- 5.5 Die funksie $h(x) = 3^{-x}$ word gevorm deur transformasies op $g(x) = 3^{-x+2} - 1$.
Beskryf die transformasies op g om h te word. (2)
- 5.6 Bepaal die inverse funksie van $h(x) = 3^{-x}$ en gee dit in die vorm $h^{-1}(x) = \dots$. (2)

[16]

VRAAG 6

- 6.1 Die skets hieronder toon die grafiek van die funksie $f(x) = -(x - 1)^2 - 2$. Die punt A is die y -afsnit van f . 'n Raaklyn aan die grafiek van f word getrek by A(0; -3).



- 6.1.1 Skryf die koördinate van die draaipunt van f neer. (2)
- 6.1.2 Bepaal die y -afsnit van f . (2)
- 6.1.3 Bereken die x -afsnit van die raaklyn. (6)
- 6.1.4 Die grafiek van $g(x) = f(x) + k$ word gevorm deur die grafiek van f te translêer. Hierdie grafiek, $y = g(x)$, het twee positiewe x -afsnitte. Bepaal die moontlike waardes van k . (3)
- 6.2 6.2.1 Gegee $f(x) = -\sqrt{x}, x \geq 0$. Bepaal die vergelyking van die inverse funksie van f in die vorm $f^{-1}(x) = \dots$ (2)
- 6.2.2 Gee die definisie- en die waardeversameling van $y = f^{-1}(x)$. (2)
- 6.2.3 Skets die grafiek van $y = f^{-1}(x)$ (2)

[19]



VRAAG 7

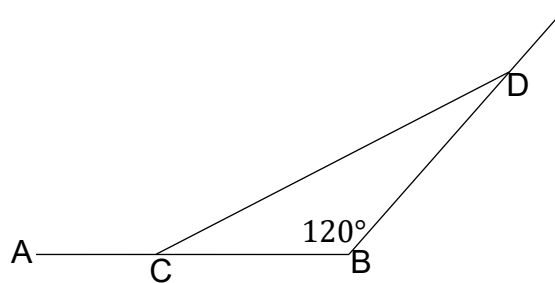
7.1 As $f(x) = 2x^2 - 7x$, Bepaal die afgeleide $f'(x)$ vanaf grondbeginsels. (5)

7.2 Differensieer die volgende funksies:

7.2.1 $f(x) = 5x^4 - \pi$ (2)

7.2.2 $g(x) = (3x - 2)(\sqrt{x} + 1)$ (4)

7.3 Die skets hieronder toon 'n reguit pad AB van 12 km. 'n Man begin draf teen 'n spoed van 8 km/h van A na B. Op dieselfde tyd begin 'n vrou te draf teen 'n spoed van 8 km/h op 'n ander reguit pad wat by B begin. Hierdie pad maak 'n hoek van 120° met pad AB. Na 'n tyd van t ure is die man by C en die vrou by D.



7.3.1 Hoe lank nadat hulle begin draf het, sal die afstand CD tussen die man en vrou 'n minimum wees? (6)

7.3.2 Bepaal hierdie minimum afstand CD. (1)

[18]

VRAAG 8

Gegee $g(x) = -x^3 + 3x^2 - 4$

8.1 Dit word gegee dat $g(-1) = 0$. Bereken alle x -afsnitte van g . (4)

8.2 Bepaal die koördinate van die draaipunte van g . (4)

8.3 Teken die grafiek van g op 'n assestelsel. Toon duidelik alle afsnitte met die asse asook die draaipunte. (3)

8.4 Bepaal 'n ander x -waarde van g waar die gradiënt van g gelyk is aan die gradiënt van 'n raaklyn wat by $x = -1$ getrek word. (6)

[17]

**VRAAG 9**

- 9.1 Indien twee gebeure onderling uitsluitend is, sal hulle ook altyd komplimentêr wees? (1)
- 9.2 Die waarskynlikheid om 'n A vir Engels in a toets te kry is $3x$.
Die waarskynlikheid om nie 'n A vir Engels te kry nie is $4x^2$.
Bereken die waarskynlikheid dat jy 'n A sal kry in jou volgende Engels toets. (5)
- 9.3 Vyf kinders word gekies uit 'n klas wat 12 meisies en 8 seuns het, om op stoele wat genommer is 1 tot 5 te sit. Volgorde maak saak.
- 9.3.1 Bepaal die maniere waarop dit kan gebeur indien daar geen beperking tussen seuns en meisies is nie. (3)
- 9.3.2 Wat is die waarskynlikheid dat 3 meisies en 2 seuns gekies sal word? (4)

[13]**GROOTTOTAAL: [150]**



INLIGTINGSBLAD: WISKUNDE

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

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

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

$$S_n = \frac{n}{2} [2a + (n - 1)d]$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; \quad r \neq 1$$

$$S_\infty = \frac{a}{1 - r}; \quad -1 < r < 1$$

$$F = \frac{x[(1 + i)^n - 1]}{i}$$

$$P = \frac{x[1 - (1 + i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad a^2 = b^2 + c^2 - 2bc \cdot \cos A \quad \text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2\sin^2 \alpha \\ 2\cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2 \sin \alpha \cdot \cos \alpha$$

$$\bar{x} = \frac{\sum fx}{n}$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

