basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NASIONALE SENIOR SERTIFIKAAT

GRAAD 11

WISKUNDE V1

NOVEMBER 2015

PUNTE: 150

TYD: 3 uur

Hierdie vraestel bestaan uit 8 bladsye.

INSTRUKSIES EN INLIGTING

Lees die volgende instruksies aandagtig deur voordat jy die vrae beantwoord.

1. Hierdie vraestel bestaan uit 9 vrae.
2. Beantwoord AL die vrae.
3. Nommer die antwoorde korrek volgens die nommeringstelsel wat in hierdie vraestel gebruik is.
4. Dui ALLE berekeninge, diagramme, grafieke ensovoorts wat jy gebruik het om jou antwoorde te bepaal, duidelik aan.
5. Volpunte sal nie noodwendig aan slegs antwoorde toegeken word nie.
6. Jy mag 'n goedgekeurde wetenskaplike sakrekenaar (nieprogrammeerbaar en niegrafies) gebruik, tensy anders aangedui.
7. Indien nodig, rond antwoorde tot TWEE desimale plekke af, tensy anders aangedui.
8. Diagramme is NIE noodwendig volgens skaal geteken NIE.
9. Skryf netjies en leesbaar.

VRAAG 1

1.1 Los op vir x in elk van die volgende:

1.1.1 $x^2+x-12=0$ (3)

1.1.2 $\sqrt{2x+1}=x-1$ (5)

1.1.3 $2^{x\sqrt{x}}=2^{27}$ (4)

1.1.4 $x^2-2x-8<0$ (3)

1.2 Gegee: $f(x)=5x^2+6x-7$

1.2.1 Los op vir x as $f(x)=0$ (korrek tot TWEE desimale plekke). (4)

1.2.2 Vervolgens, of andersins, bereken die waarde van d waarvoor $5x^2+6x-d=0$ gelyke wortels het. (3)

1.3 Los gelyktydig vir x en y op:

$x-2y=-3$ en $xy=20$ (6)

[28]

VRAAG 2

2.1 Vereenvoudig, sonder om 'n sakrekenaar te gebruik:

2.1.1 $\dfrac{2^{n+2}.4^{n+1}}{8^{n-1}}$ (3)

2.1.2 $\sqrt{x+\sqrt{2x-1}}.\sqrt{x-\sqrt{2x-1}}$ (4)

2.2 Gegee: $P=\sqrt{\dfrac{5}{x+2}}+\dfrac{x}{3}$

2.2.1 Vir watter waarde(s) van x sal P 'n reële getal wees? (2)

2.2.2 Toon aan dat P rasionaal is as $x=3$. (2)

2.3 Bereken die som van die syfers van $2^{2015}\times 5^{2019}$. (4)

[15]

VRAAG 3

3.1 Die lineêre patroon word gegee: $5 ; -2 ; -9 ; \ldots ; -289$

3.1.1 Skryf die eerste gemene verskil neer. (1)

3.1.2 Skryf die waarde van T_4 neer. (1)

3.1.3 Bereken die getal terme in die patroon. (3)

3.2 Die verskil tussen opeenvolgende terme in 'n lineêre patroon is 3 en die 20^{ste} term is gelyk aan 64 (met ander woorde $T_{20} = 64$).

3.2.1 Bepaal die waarde van T_{22}. (1)

3.2.2 Watter term in die patroon sal gelyk wees aan $3T_5 - 2$? (4)

3.3 Beskou die kwadratiese patroon: $5 ; 12 ; 29 ; 56 ; \ldots$

3.3.1 Skryf die VOLGENDE TWEE terme van die patroon neer. (2)

3.3.2 Bewys dat die eerste verskille van hierdie patroon altyd onewe sal wees. (3)
[15]

VRAAG 4

4.1 Beskou die kwadratiese patroon: $3 ; 5 ; 8 ; 12 ; \ldots$

Bepaal die waarde van T_{26}. (6)

4.2 'n Sekere kwadratiese patroon het die volgende eienskappe:

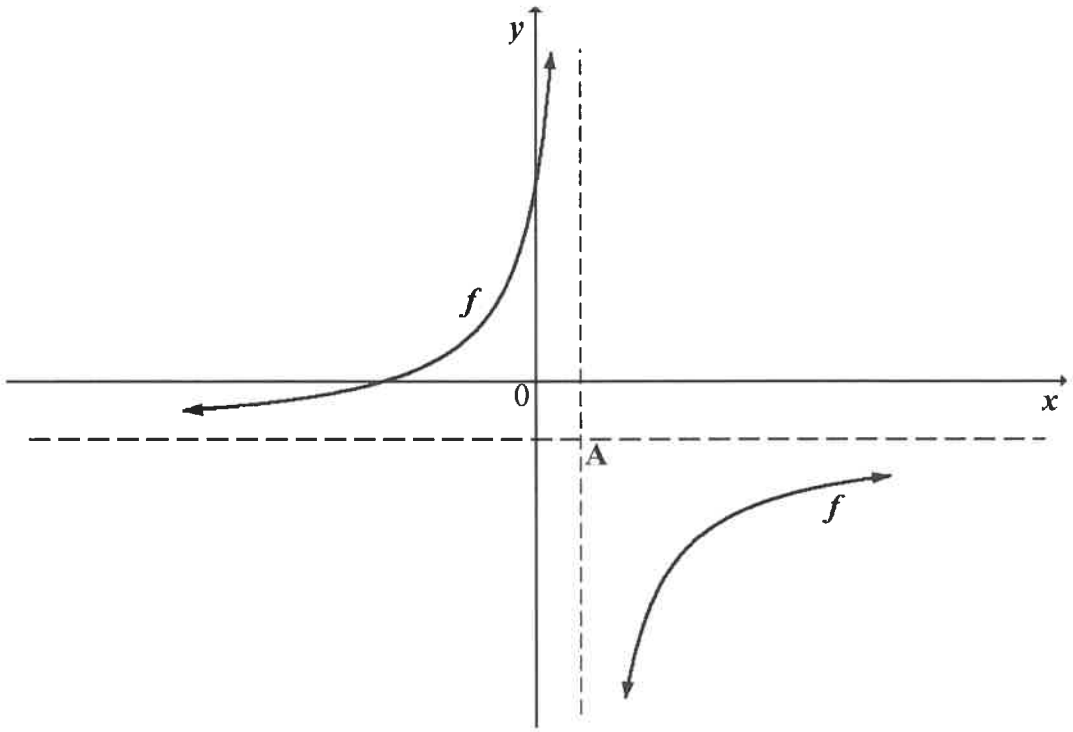
- $T_1 = p$
- $T_2 = 18$
- $T_4 = 4T_1$
- $T_3 - T_2 = 10$

Bepaal die waarde van p. (6)
[12]

VRAAG 5

5.1 Die skets hieronder toon die grafiek van $f(x)=\frac{-9}{x-1}-2$.

A is die snypunt van die asimptote van f.



5.1.1 Skryf die koördinate van A neer. (2)

5.1.2 Bepaal die koördinate van die x- en y-afsnitte van f. (5)

5.1.3 Skryf 'n vergelyking van die simmetrie-as van f neer wat 'n negatiewe gradiënt het. (2)

5.1.4 Vervolgens, of andersins, bepaal die koördinate van 'n punt wat op f in die vierde kwadrant lê en wat die naaste aan punt A is. (5)

5.1.5 Die grafiek van f word om die x-as gereflekteer om die grafiek van g te vorm. Skryf die vergelyking van g neer, in die vorm $y=...$ (2)

5.2 Gegee: $h(x)=4\left(2^{-x}\right)+1$

5.2.1 Bepaal die koördinate van die y-afsnit van h. (2)

5.2.2 Verduidelik waarom h geen x-afsnit het nie. (2)

5.2.3 Teken 'n sketsgrafiek van h en dui duidelik alle asimptote, afsnitte met die asse en minstens een ander punt op h aan. (3)

5.2.4 Beskryf die transformasie van h na g as $g(x)=4\left(2^{-x}+2\right)$. (2)

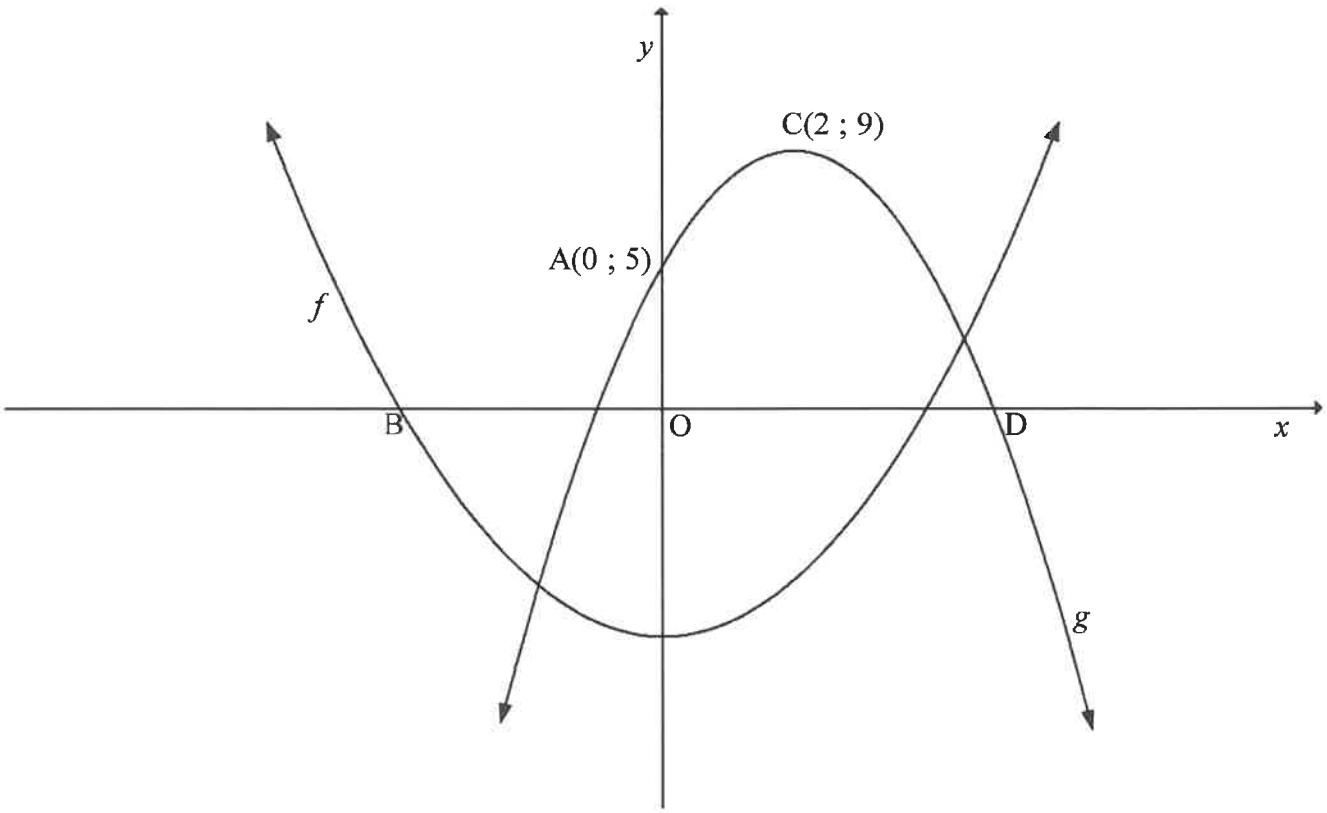
[25]

VRAAG 6

Die skets hieronder verteenwoordig die grafieke van twee parabole, f en g.

$f(x)=\frac{1}{2}x^2-8$

Die draaipunt van g is C (2 ; 9) en die y-afsnit van g is A (0 ; 5).
B en D is die x-afsnitte van f en g onderskeidelik.



6.1 Toon aan dat $g(x)=-x^2+4x+5$. (4)

6.2 Bereken die gemiddelde gradiënt van g tussen A en C. (2)

6.3 Bereken die lengte van BD. (5)

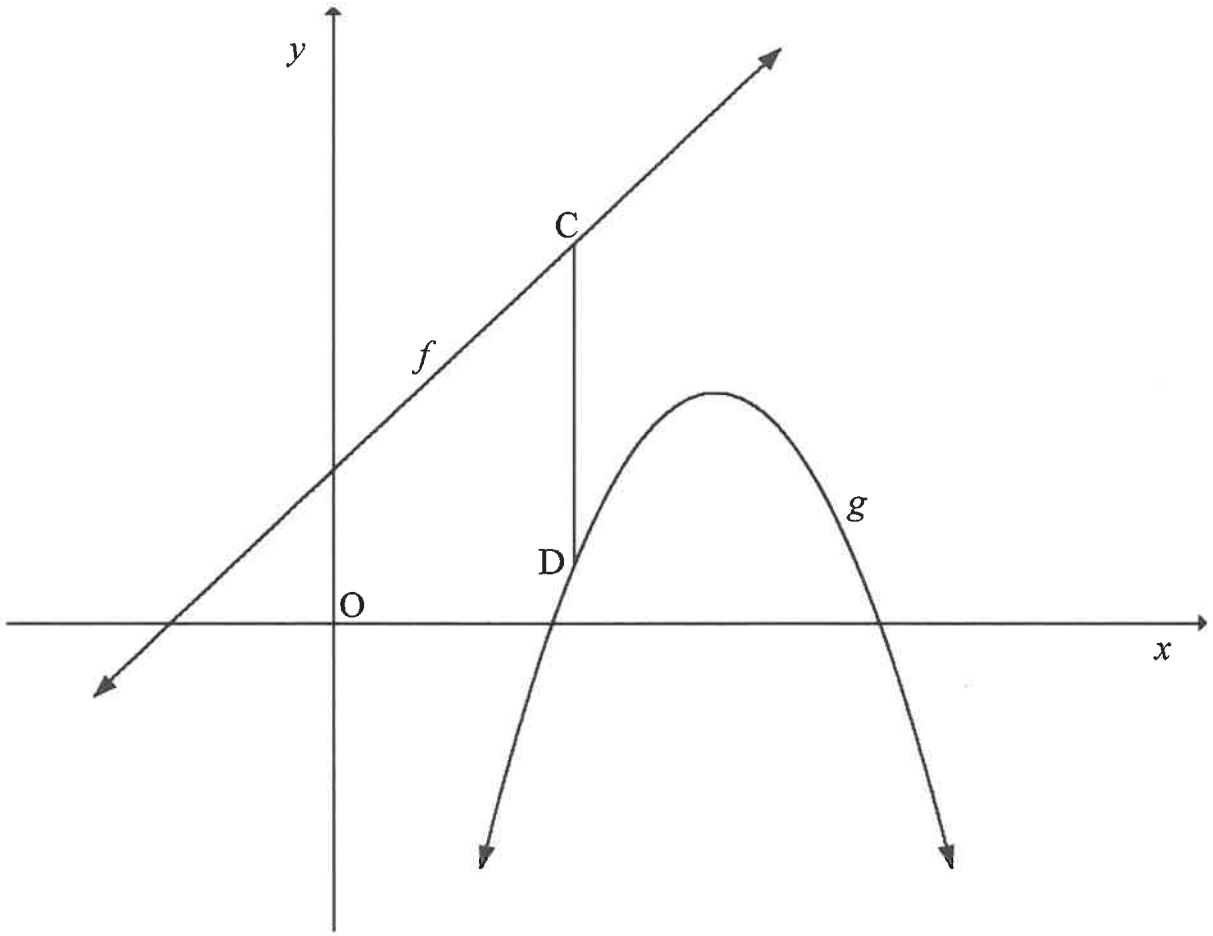
6.4 Gebruik die grafieke om vir x op te los, as:

6.4.1 $f(x)\geq 0$ (2)

6.4.2 f en g albei streng stygend is (2)
[15]

VRAAG 7

Die skets hieronder toon die grafieke van $f(x) = 2x + 3$ en $g(x) = -2x^2 + 14x + k$.
C is enige punt op f en D enige punt op g, sodanig dat CD ewewydig aan die y-as is.
k is 'n waarde sodanig dat C bokant D lê.



7.1 Skryf 'n vereenvoudigde uitdrukking in terme van x en k vir die lengte van CD neer. (3)

7.2 As die minimum lengte van CD 5 is, bereken die waarde van k. (4)
[7]

VRAAG 8

8.1 'n Skool koop tablette teen 'n totale koste van R140 000. As die gemiddelde inflasiekoers 6,1% per jaar oor die volgende 4 jaar is, bepaal die koste om hierdie tablette oor 4 jaar te vervang. (3)

8.2 'n Belegging verdien rente teen 'n koers van 7% per jaar, halfjaarliks saamgestel. Bereken die effektiewe jaarlikse rentekoers op hierdie belegging. (3)

8.3 'n Spaarrekening is met 'n aanvanklike deposito van R24 000 oopgemaak. Agtien maande later is R7 000 uit die rekening onttrek. Bereken hoeveel geld in die spaarrekening aan die einde van 4 jaar sal wees as die rentekoers 10,5% p.j., maandeliks saamgestel, was. (5)

8.4 'n Kar wat R198 000 kos, het 'n boekwaarde van R102 755,34 na 3 jaar. As die waarde van die kar teen r% p.j. op 'n verminderde saldo verminder, bereken r. (5)
[16]

VRAAG 9

9.1 Gegee: $P(A) = 0,6$
$P(B) = 0,3$
$P(A \text{ of } B) = 0,8$ waar A en B twee verskillende gebeurtenisse is

Is die gebeurtenisse A en B onderling uitsluitend? Motiveer jou antwoord met toepaslike berekeninge en/of 'n diagram. (4)

9.2 Die tabel hieronder toon data oor die maandelikse inkomste van werkende persone in twee woongebiede. Verteenwoordigende steekproewe is in die versameling van die data gebruik.

MAANDELIKSE INKOMSTE (IN RAND)	GEBIED 1	GEBIED 2	TOTAAL
$x < 3\,200$	500	460	960
$3\,200 \leq x < 25\,600$	1 182	340	1 522
$x \geq 25\,600$	150	14	164
Totaal	1 832	814	2 646

9.2.1 Wat is die waarskynlikheid dat 'n persoon wat willekeurig uit die volledige steekproef gekies word:

(a) Uit Gebied 1 sal kom (2)

(b) Uit Gebied 2 sal kom en minder as R3 200 per maand sal verdien (1)

(c) 'n Persoon uit Gebied 2 sal wees wat presies R3 200 of meer verdien (2)

9.2.2 Bewys dat om 'n inkomste van minder as R3 200 per maand te verdien, nie onafhanklik is van die gebied waar 'n persoon woon nie. (5)

9.2.3 Wat is meer waarskynlik: 'n persoon uit Gebied 1 wat minder as R3 200 verdien of 'n persoon uit Gebied 2 wat minder as R3 200 verdien? Toon berekeninge om jou antwoord te ondersteun. (3)
[17]

TOTAAL: 150

basic education

Department:
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REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS P1

NOVEMBER 2015

MARKS: 150

TIME: 3 hours

This question paper consists of 8 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions.
2. Answer ALL the questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs et cetera that you have used in determining your answers.
5. Answers only will not necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. Write neatly and legibly.

QUESTION 1

1.1 Solve for x in each of the following:

1.1.1 $x^2+x-12=0$ (3)

1.1.2 $\sqrt{2x+1}=x-1$ (5)

1.1.3 $2^{x\sqrt{x}}=2^{27}$ (4)

1.1.4 $x^2-2x-8<0$ (3)

1.2 Given: $f(x)=5x^2+6x-7$

1.2.1 Solve for x if $f(x)=0$ (correct to TWO decimal places). (4)

1.2.2 Hence, or otherwise, calculate the value of d for which $5x^2+6x-d=0$ has equal roots. (3)

1.3 Solve for x and y simultaneously:

$x-2y=-3$ and $xy=20$ (6)

[28]

QUESTION 2

2.1 Simplify, without using a calculator:

2.1.1 $\dfrac{2^{n+2}.4^{n+1}}{8^{n-1}}$ (3)

2.1.2 $\sqrt{x+\sqrt{2x-1}}.\sqrt{x-\sqrt{2x-1}}$ (4)

2.2 Given: $\text{P}=\sqrt{\dfrac{5}{x+2}}+\dfrac{x}{3}$

2.2.1 For what value(s) of x will P be a real number? (2)

2.2.2 Show that P is rational if $x=3$. (2)

2.3 Calculate the sum of the digits of $2^{2015}\times 5^{2019}$. (4)

[15]

QUESTION 3

3.1 Given the linear pattern: $5 ; -2 ; -9 ; \ldots ; -289$

3.1.1 Write down the constant first difference. (1)

3.1.2 Write down the value of T_4. (1)

3.1.3 Calculate the number of terms in the pattern. (3)

3.2 A linear pattern has a difference of 3 between consecutive terms and its 20^{th} term is equal to 64 (that is $T_{20} = 64$).

3.2.1 Determine the value of T_{22}. (1)

3.2.2 Which term in the pattern will be equal to $3T_5 - 2$? (4)

3.3 Consider the quadratic pattern: $5 ; 12 ; 29 ; 56 ; \ldots$

3.3.1 Write down the NEXT TWO terms of the pattern. (2)

3.3.2 Prove that the first differences of this pattern will always be odd. (3)
[15]

QUESTION 4

4.1 Consider the quadratic pattern: $3 ; 5 ; 8 ; 12 ; \ldots$

Determine the value of T_{26}. (6)

4.2 A certain quadratic pattern has the following characteristics:

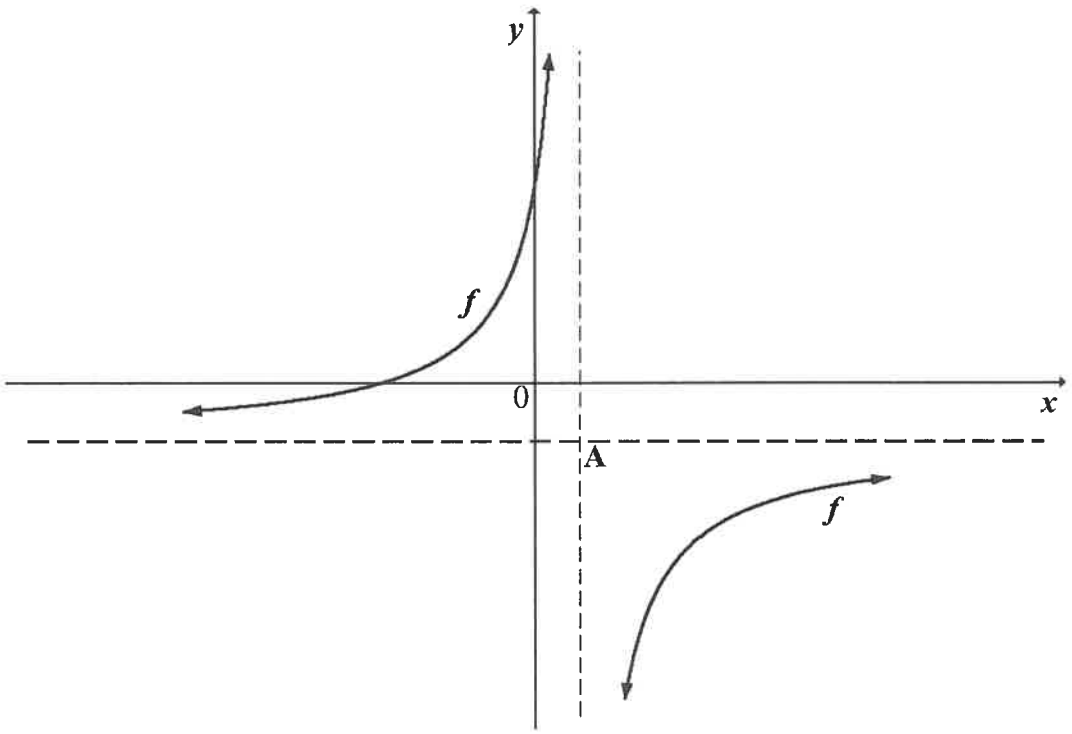
- $T_1 = p$
- $T_2 = 18$
- $T_4 = 4T_1$
- $T_3 - T_2 = 10$

Determine the value of p. (6)
[12]

QUESTION 5

5.1 The sketch below shows the graph of $f(x) = \frac{-9}{x-1} - 2$.

A is the point of intersection of the asymptotes of f.



5.1.1 Write down the coordinates of A. (2)

5.1.2 Determine the coordinates of the x- and y-intercepts of f. (5)

5.1.3 Write down an equation of the axis of symmetry of f that has a negative gradient. (2)

5.1.4 Hence, or otherwise, determine the coordinates of a point that lies on f in the fourth quadrant, which is the closest to point A. (5)

5.1.5 The graph of f is reflected about the x-axis to obtain the graph of g. Write down the equation of g in the form $y = ...$ (2)

5.2 Given: $h(x) = 4\left(2^{-x}\right) + 1$

5.2.1 Determine the coordinates of the y-intercept of h. (2)

5.2.2 Explain why h does not have an x-intercept. (2)

5.2.3 Draw a sketch graph of h, clearly showing all asymptotes, intercepts with the axes and at least one other point on h. (3)

5.2.4 Describe the transformation from h to g if $g(x) = 4\left(2^{-x} + 2\right)$. (2)

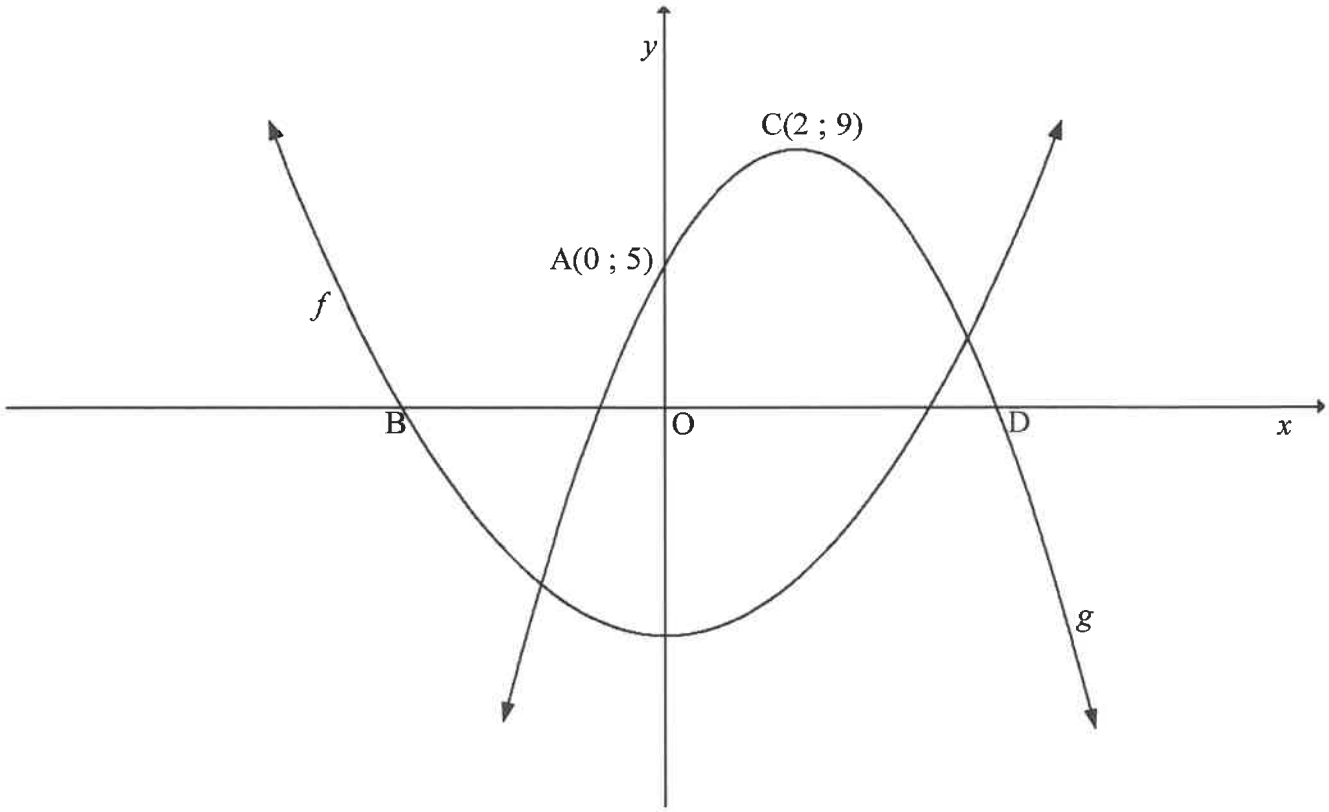
[25]

QUESTION 6

The sketch below represents the graphs of two parabolas, f and g.

$f(x)=\frac{1}{2}x^2-8$

The turning point of g is C (2 ; 9) and the y-intercept of g is A (0 ; 5).
B and D are the x-intercepts of f and g respectively.



6.1 Show that $g(x)=-x^2+4x+5$. (4)

6.2 Calculate the average gradient of g between A and C. (2)

6.3 Calculate the length of BD. (5)

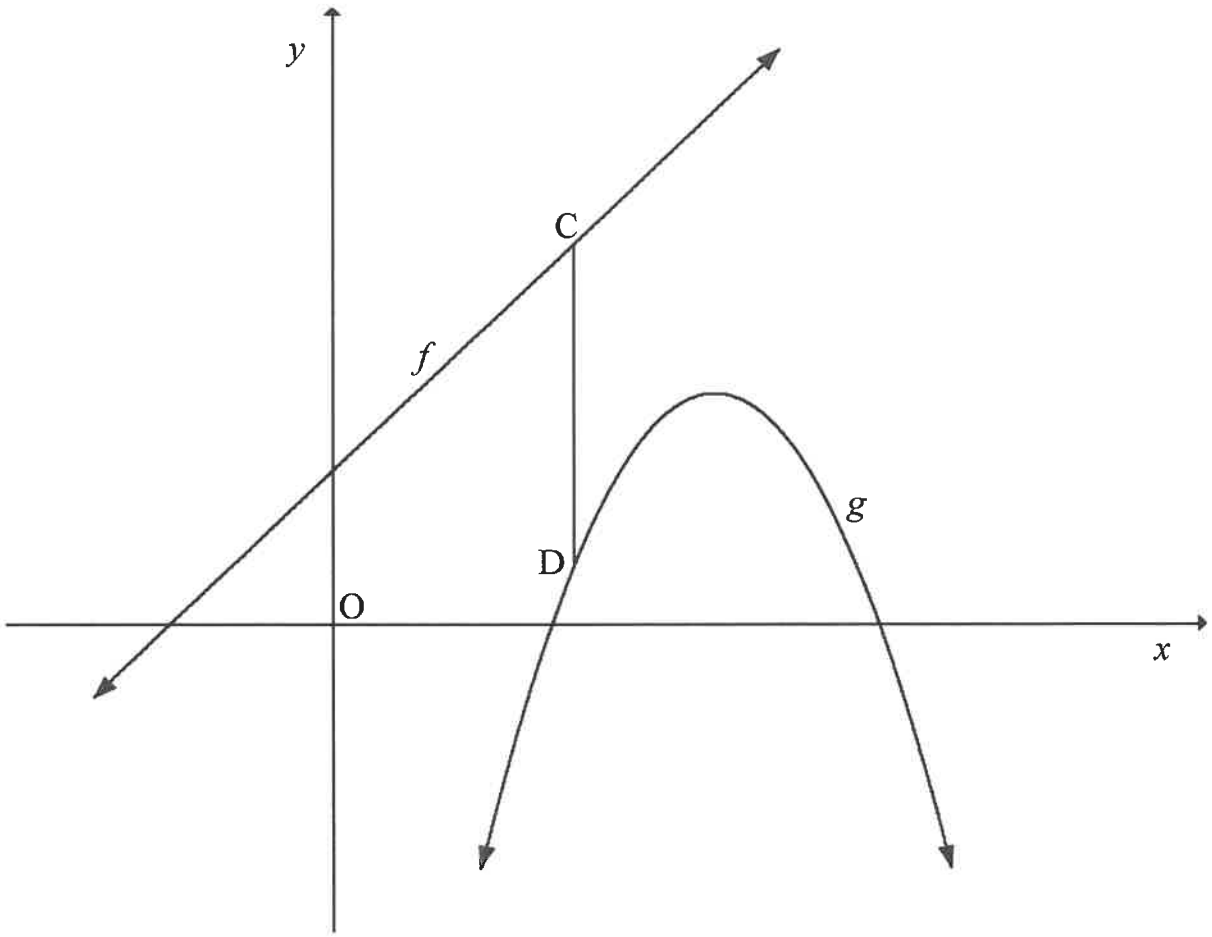
6.4 Use the graphs to solve for x, if:

6.4.1 $f(x)\geq 0$ (2)

6.4.2 f and g are both strictly increasing (2)
[15]

QUESTION 7

The sketch below shows the graphs of $f(x) = 2x + 3$ and $g(x) = -2x^2 + 14x + k$.
C is any point on f and D any point on g, such that CD is parallel to the y-axis.
k is a value such that C lies above D.



7.1 Write down a simplified expression for the length of CD in terms of x and k. (3)

7.2 If the minimum length of CD is 5, calculate the value of k. (4)
[7]

QUESTION 8

8.1 A school buys tablets at a total cost of R140 000. If the average rate of inflation is 6,1% per annum over the next 4 years, determine the cost of replacing these tablets in 4 years' time. (3)

8.2 An investment earns interest at a rate of 7% per annum, compounded semi-annually. Calculate the effective annual interest rate on this investment. (3)

8.3 A savings account was opened with an initial deposit of R24 000. Eighteen months later R7 000 was withdrawn from the account. Calculate how much money will be in the savings account at the end of 4 years if the interest rate was 10,5% p.a., compounded monthly. (5)

8.4 A car costing R198 000 has a book value of R102 755,34 after 3 years. If the value of the car depreciates at r% p.a. on a reducing balance, calculate r. (5)
[16]

QUESTION 9

9.1 Given: $P(A) = 0,6$
$P(B) = 0,3$
$P(A \text{ or } B) = 0,8$ where A and B are two different events

Are the events A and B mutually exclusive? Justify your answer with appropriate calculations and/or a diagram. (4)

9.2 The table below shows data on the monthly income of employed people in two residential areas. Representative samples were used in the collection of the data.

MONTHLY INCOME (IN RANDS)	AREA 1	AREA 2	TOTAL
$x < 3\,200$	500	460	960
$3\,200 \leq x < 25\,600$	1 182	340	1 522
$x \geq 25\,600$	150	14	164
Total	1 832	814	2 646

9.2.1 What is the probability that a person chosen randomly from the entire sample will be:

(a) From Area 1 (2)

(b) From Area 2 and earn less than R3 200 per month (1)

(c) A person from Area 2 who earns more than or equal to R3 200 (2)

9.2.2 Prove that earning an income of less than R3 200 per month is not independent of the area in which a person resides. (5)

9.2.3 Which is more likely: a person from Area 1 earning less than R3 200 or a person from Area 2 earning less than R3 200? Show calculations to support your answer. (3)
[17]

TOTAL: 150