HOËRSKOOL JOHAN JURGENS

MATHEMATICS

GRADE 11: EXAMINATION PAPER 1 **NOV 2025** TERM 4

TIME: 3 HOURS **TOTAL MARKS**: 150

EXAMINER: Z CRONJE **MODERATOR:** M BOTHA

Instructions to Learners:

1. Please write your name, surname, grade, and date on the answer sheet.
2. Read all questions carefully and think before your answer.
3. Clearly show ALL calculations, diagrams, graphs, etcetera that you have used in determining the answers.
4. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
5. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
6. Diagrams are NOT necessarily drawn to scale.
7. Number the answers correctly according to the numbering system used in this question paper.
8. Write with a black or blue pen and cross out with a pencil if you make a mistake.
9. Please write neatly and legibly.
10. Good luck!!!!

This paper consists of 7 pages and 9 questions including an information sheet.

QUESTION 1

1.1 Solve for *x*:

1.1.1 $2x^2 = 8$ (3)

1.1.2 $3x^2 + 5x = 1$ (Rounded to ONE decimal) (4)

1.1.3 $\sqrt{5-4x} - x = 0$ (4)

1.1.4 $x^2 - 9x \leq -20$ (4)

1.2 Solve for *x* by completing the square: $2x^2 + 8x - 3 = 0$ (4)

1.3 Solve for *x* and *y* simultaneously in the equations below:

$x - y = 6$

$x^2 - 5y^2 + 20 = xy$ (6)

1.4 Given the equation: $(k+1)x^2 + 4x - k + 1 = 0$

Show that the roots of the equation are real for all real values of *k*. (3)

[28]

QUESTION 2

2.1 Simplify the exponential expressions below:

2.1.1 $\dfrac{2^{-x}.\frac{1}{2^x}.6^{x+1}.9^x}{4^{2x-1}.3^{-x}}$ (3)

2.1.2 $\dfrac{7.3^{x+2} - 49.3^x}{3^{x-3} + 3^{x+1}}$ (4)

2.1.3 $\dfrac{4^x - 1}{2^x - 1}$ (3)

2.2 Determine the value of $\left(3\sqrt{5} - \sqrt{7}\right)^2$ (3)

2.3 Solve the exponential equations below:

2.3.1 $5.3^{x-1} = 45$ (2)

2.3.2 $3(3^{2x} + 9.3^x) = 30$ (4)

2.3.3 $x^{\frac{3}{2}} = 27$ (3)

[22]

QUESTION 3

Consider the number pattern:

$$\frac{2}{5};\frac{9}{10};\frac{7}{5};\frac{19}{10};\ldots$$

3.1 Is this number pattern *linear* or *quadratic*? Motivate your answer. (2)

3.2 Write down the next TWO terms. (2)

3.3 Determine the 17th term of the number pattern. (4)

3.4 Determine the value of *n* if $T_n = \frac{62}{5}$ (3)

[11]

QUESTION 4

Study the quadratic number pattern below and answer the questions that follow:

$$[x^2 + 3y]; [4x^2 + 4y]; [9x^2 + 5y]; [16x^2 + 6y] \ldots$$

Determine:

4.1 the NEXT TWO terms (2)

4.2 a formula for the n^{th} term in simplified form. (3)

4.3 T_9 for the pattern. (2)

4.4 the value of n if $T_n = 121x^2 + 13y$ (3)

4.5 first FOUR terms if $x = 3; y = -1$ (4)

[14]

QUESTION 5

Consider the graphs of $f(x) = -(x-2)^2 + 9$ and $g(x) = 3x + 3$

5.1 Write down the coordinates of the turning point of f. (1)

5.2 Determine the x-intercepts of f. (4)

5.3 Determine the coordinates of the x-intercept of g. (2)

5.4 Sketch the graphs of f and g on the same Cartesian plane ON THE ANSWER SHEET. Clearly show ALL intercepts with the axes and turning points. (5)

5.5 Determine the value(s) of x for which:

5.5.1 $f(x) < 0$ (2)

5.5.2 $f(x) \geq g(x)$ (2)

5.6 Consider the graph of $h(x) = f(x) + k$

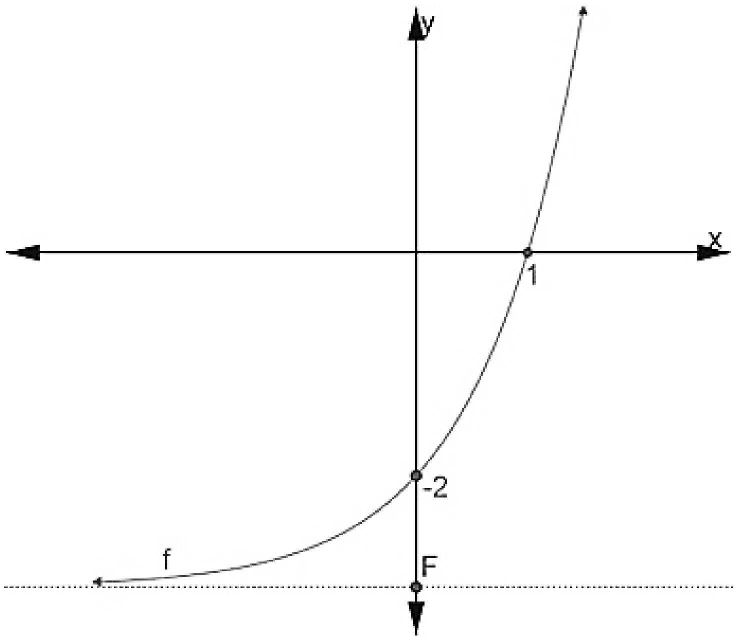
5.6.1 Determine the value(s) of k for which h will have EQUAL roots. (2)

5.6.2 Suppose $k = 3$, describe the transformation of f to form h. (1)

[19]

QUESTION 6

Consider the graph of $f(x) = a^x - 3$



6.1 Write down the coordinates of the x-intercept. (1)

6.2 Write down the coordinates of F. (2)

6.3 Determine the value of a. (2)

6.4 Write down the range of f. (2)

6.5 Determine the value(s) of x for which $f(x) \geq 0$. (2)

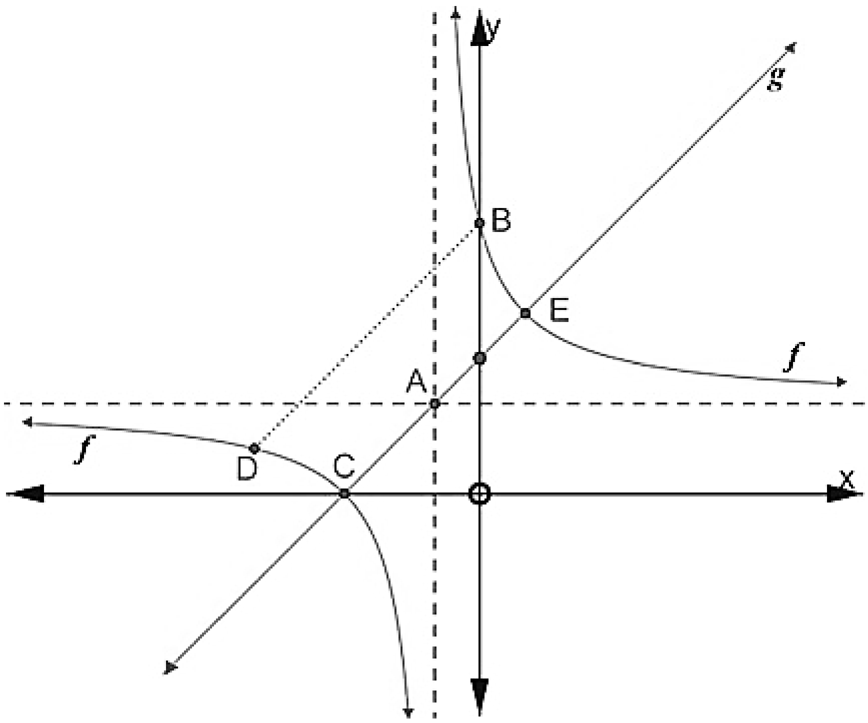
6.6 Determine the equation of g if f is reflected in the y-axis. (2)

[11]

QUESTION 7

The graphs of f and g are drawn below:

- $f(x) = \frac{4}{x+1} + 2$
- B and C are the intercepts of f
- A is the intersection of the asymptotes
- C is also the x-intercept of g
- E is another point where f and g intersect



7.1 Determine the coordinates of A, B and C. (5)

7.2 Consider the graph of $g(x) = mx + c$

7.2.1 Explain the significance of g in context with f. (1)

7.2.2 Determine the equation of g. (2)

7.3 Determine the coordinates of E. (3)

7.4 D is a point on f such that DB || CE. Determine the coordinates of D. (4)

[15]

QUESTION 8

8.1 Consider an investment of R50 000 for 5 years at 12% p.a., compounded monthly.

8.1.1 Calculate the future value of the investment. (3)

8.1.2 Convert the nominal interest rate to the annual effective interest rate. (2)

8.1.3 Use the annual effective interest rate to calculate the future value of the investment. (3)

8.2 Ms. Venter deposits R6 000 in a savings account. Four years later she adds another R4 000. For the first two years the interest rate is 13% p.a., compounded quarterly. Thereafter the interest rate changes to 11% p.a., compounded monthly.

Determine the future value of the investment at the end of the sixth year. (6)

[14]

QUESTION 9

Information was gathered on a group of Grade 11 learners' subjects offered:

- The probability that a learner offers Mathematics (M) is 0,4.
- The probability that a learner offers Accounting (A) is 0,5.
- The probability that a learner does not offer any of the two subjects is 0,3.
- The probability that a learner offers both subjects is x.

9.1 Draw a Venn diagram to represent the two probabilities (4)

9.2 Determine the value of x. (4)

9.3 Write the probability that a learner offers BOTH subjects to the nearest percentage. (2)

9.4 Determine the probability that a learner:

9.4.1 offers at LEAST ONE of the two subjects, as a fraction. (3)

9.4.2 ONLY offers ONE of the two subjects. (3)

[16]

TOTAL: 150

INFORMATION SHEET

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

$A = P(1 + ni)$ $\quad$ $A = P(1 - ni)$ $\quad$ $A = P(1 + i)^n$ $\quad$ $A = P(1 - i)^n$

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

$T_n = ar^{n-1}$ $\quad$ $S_n = \frac{a(r^n - 1)}{r - 1}$; $r \neq 1$ $\quad$ $S_\infty = \frac{a}{1 - r}$; $-1 < r < 1$

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

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

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $\quad$ $M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$

$y = mx + c$ $\quad$ $y - y_1 = m(x - x_1)$ $\quad$ $m = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad$ $m = \tan\theta$

$(x - a)^2 + (y - b)^2 = r^2$ $\quad$ In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

In ΔABC: $a^2 = b^2 + c^2 - 2bc.\cos A$ $\quad$ Area $\Delta ABC = \frac{1}{2}ab.\sin C$

$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta$ $\quad$ $\sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$

$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta$ $\quad$ $\cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$

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

$\sin 2\alpha = 2\sin\alpha.\cos\alpha$

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

$P(A) = \frac{n(A)}{n(S)}$ $\quad$ $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$\hat{y} = a + bx$ $\quad$ $b = \frac{\Sigma(x - \bar{x})(y - \bar{y})}{\Sigma(x - \bar{x})^2}$