

SMARTWIZ

GRADE 12 MATHEMATICS EXAM

MARKS: 150

TIME: 3 HOURS

SCHOOL _____

CLASS (eg. 4A) _____

SURNAME _____

NAME _____

MARKS	
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Instructions for Learners:

- Read all instructions carefully before you begin the exam.
- Write your full name and student number clearly on the answer sheet/book.
- Answer all questions unless otherwise instructed.
- Show all your work/calculations where necessary.
- Write neatly and clearly.
- Use only a blue or black pen. Do not use correction fluid or tape.
- Electronic devices (calculators, cell phones, etc.) are not allowed unless explicitly permitted.
- Raise your hand if you have any questions.
- Do not talk to other learners during the exam.
- Any form of dishonesty will result in immediate disqualification from the exam.

This exam consists of Five pages, including the cover page.

QUESTION 1: ALGEBRA [20 marks]

1.1 Simplify the expression:

$$\frac{2x^2 - 8}{x^2 - 4x} \div \frac{x^2 - 4x}{x^2 - 8}$$

1.2 Solve for x:

$$3x^2 - 2x - 5 = 0$$

1.3 Solve for x:

$$\log_2(x+1) = 3$$

QUESTION 2: FUNCTIONS AND GRAPHS [20 marks]

2.1 Sketch the graph of $f(x) = x^2 - 4x + 3$. Indicate:

- The intercepts with the axes.
- The turning point.
- The domain and range.

2.2 Determine the inverse of $f(x)=2x-5$ $f(x)=2x-5$.

QUESTION 3: TRIGONOMETRY [20 marks]

3.1 Simplify:

$$\sin^2 x + \cos^2 x \sin x \cdot \cos x \frac{\sin^2 x + \cos^2 x}{\sin x \cdot \cos x} \sin x \cdot \cos x \sin^2 x + \cos^2 x$$

3.2 Solve for θ θ in the interval $0^\circ \leq \theta \leq 360^\circ$ $0^\circ \leq \theta \leq 360^\circ$:

$$2\sin \theta - 1 = 0 \quad \sin \theta - 1 = 0 \quad \sin \theta - 1 = 0$$

QUESTION 4: CALCULUS [30 marks]

4.1 Differentiate:

$$f(x)=3x^3-5x^2+2x-7 \quad f(x)=3x^3-5x^2+2x-7$$

4.2 Determine the coordinates of the turning points of the function:

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

4.3 Integrate:

$$\int (2x^2-3x+1) dx \quad \int (2x^2-3x+1) dx$$

QUESTION 5: GEOMETRY [20 marks]

5.1 In triangle ABC, $AB=7$ $AB=7$, $AC=5$ $AC=5$, and angle $A=60^\circ$ $A=60^\circ$. Use the cosine rule to find BC.

5.2 Prove that opposite angles in a cyclic quadrilateral are supplementary.

QUESTION 6: PROBABILITY & STATISTICS [20 marks]

6.1 A die is thrown. What is the probability of getting an even number?

6.2 The following marks were obtained by 5 students in a test: 50, 60, 65, 70, 75.

- Find the mean, median, and mode.
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End of Paper

TOTAL : 150

3.2

$$2\sin\theta - 1 = 0 \Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = 30^\circ, 150^\circ \quad \sin\theta - 1 = 0 \Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = 30^\circ, 150^\circ$$

QUESTION 4: CALCULUS [30 marks]

4.1

$$f(x) = 3x^3 - 5x^2 + 2x - 7 \Rightarrow f'(x) = 9x^2 - 10x + 2 \quad f(x) = 3x^3 - 5x^2 + 2x - 7 \Rightarrow f'(x) = 9x^2 - 10x + 2$$

4.2

$$f(x) = -x^2 + 4x - 3 \Rightarrow f'(x) = -2x + 4 = 0 \Rightarrow -2x + 4 = 0 \Rightarrow x = 2 \quad f(x) = -x^2 + 4x - 3 \Rightarrow f'(x) = -2x + 4 \Rightarrow 0 = -2x + 4 \Rightarrow x = 2$$

$$y = f(2) = -4 + 8 - 3 = 1 \Rightarrow \text{Turning point: } (2, 1) \quad y = f(2) = -4 + 8 - 3 = 1 \Rightarrow \text{Turning point: } (2, 1)$$

4.3

$$\int (2x^2 - 3x + 1) dx = \frac{2x^3}{3} - \frac{3x^2}{2} + x + C \quad \int (2x^2 - 3x + 1) dx = \frac{2x^3}{3} - \frac{3x^2}{2} + x + C$$

QUESTION 5: GEOMETRY [20 marks]

5.1

Using Cosine Rule:

$$BC^2 = 7^2 + 5^2 - 2(7)(5)\cos(60^\circ) = 49 + 25 - 70(0.5) = 74 - 35 = 39 \Rightarrow BC = \sqrt{39} \quad BC^2 = 7^2 + 5^2 - 2(7)(5)\cos(60^\circ) = 49 + 25 - 70(0.5) = 74 - 35 = 39 \Rightarrow BC = \sqrt{39}$$

5.2

In a cyclic quadrilateral, angles that lie opposite each other subtend arcs that together make a full circle. Since the sum of angles in a circle is 180° , opposite angles are supplementary.
Proof may also use: $\angle A + \angle C = 180^\circ$ in cyclic quad.

QUESTION 6: PROBABILITY & STATISTICS [20 marks]

6.1

Even numbers on a die: 2, 4, 6 \rightarrow 3 out of 6 \rightarrow

$$P(\text{even}) = \frac{3}{6} = \frac{1}{2} \quad P(\text{even}) = \frac{3}{6} = \frac{1}{2}$$

6.2

Marks: 50, 60, 65, 70, 75

- Mean = $\frac{50+60+65+70+75}{5} = \frac{320}{5} = 64$
- Median = 65 (middle value)
- Mode = None (all values occur once)

TOTAL : 150

