# **SMARTWIZ**

#### **GRADE 12 MATHEMATICS EXAM**

MARKS: 150	MARKS	
TIME: 3 HOURS		
SCHOOL		
CLASS (eg. 4A)		
SURNAME		
NAME		

#### **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]**

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Ι.		OHILL	ע וווי	uic	expression

2x2-8x2-4x $frac{2x^2 - 8}{x^2 - 4x}x2-4x2x2-8$ 

#### 1.2 Solve for xxx:

 $3x2-2x-5=03x^2 - 2x - 5 = 03x2-2x-5=0$ 

#### 1.3 Solve for xxx:

 $log[f_0]2(x+1)=3 log_2(x+1)=3 log_2(x+1)=3$ 

## **QUESTION 2: FUNCTIONS AND GRAPHS [20 marks]**

- 2.1 Sketch the graph of  $f(x)=x^2-4x+3f(x)=x^2-4x+3f(x)=x^2-4x+3$ . Indicate:
  - The intercepts with the axes.
  - The turning point.
  - The domain and range.

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

## **QUESTION 3: TRIGONOMETRY [20 marks]**

### 3.1 Simplify:

 $sin[fo]2x + cos[fo]2xsin[fo]x \cdot cos[fo]x \cdot frac{\sin^2 x + \cos^2 x}{\sin x \cdot cos x}sinx \cdot cos x + cos^2 x$ 

3.2 Solve for  $\theta$ \theta $\theta$  in the interval  $0 \le \theta \le 360 \le 0^\circ \le 100$  \text{leq \theta \leq 360^\circ0 \leq \theta \leq 360^\circ \text{leq \theta}}

 $2\sin[\theta]\theta - 1 = 02\sin\theta - 1 = 02\sin\theta - 1 = 0$ 

## QUESTION 4: CALCULUS [30 marks]

4.1 Differentiate:

 $f(x)=3x3-5x2+2x-7f(x)=3x^3-5x^2+2x-7f(x)=3x3-5x2+2x-7$ 

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

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

4.3 Integrate:

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

### **QUESTION 5: GEOMETRY [20 marks]**

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

2.2 Prove that opposite angles in a cyclic quadrilateral are supplementary.  QUESTION 6: PROBABILITY & STATISTICS [20 mark 5.1 A die is thrown. What is the probability of getting an even number?  5.2 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

#### **MEMO**

## **QUESTION 1: ALGEBRA [20 marks]**

#### 1.1

 $2x2-8x2-4x=2(x2-4)x(x-4)=2(x-2)(x+2)x(x-4) \\ frac{2x^2 - 8}{x^2 - 4x} = \frac{2(x^2 - 4)}{x(x-4)} \\ x(x-4)=2(x^2 - 4) \\ x(x-4)=2$ 

#### 1.2

 $3x2-2x-5=0 \Rightarrow x=2\pm(-2)2-4(3)(-5)2(3) \Rightarrow x=2\pm646 \Rightarrow x=2\pm863x^2 - 2x - 5 = 0 \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2(3)} \mid \text{Rightarrow } x = \frac{2 \neq (-2)^2 - 4(3)(-5)}{2($ 

#### 1.3

 $\log \frac{1}{2}(x+1)=3 \Rightarrow x+1=23=8 \Rightarrow x=7 \setminus \log_2(x+1)=3 \setminus Rightarrow \ x+1=2^3=8 \Rightarrow x=7 \setminus \log_2(x+1)=3 \Rightarrow x+1=23=8 \Rightarrow x=7 \setminus \log_2(x+1)=3 \Rightarrow x+1=23=8 \Rightarrow x=7 \setminus \log_2(x+1)=3 \setminus Rightarrow \ x+1=2^3=8 \Rightarrow x=7 \setminus Rightarrow \ x+1=2^3=8 \Rightarrow x=$ 

### **QUESTION 2: FUNCTIONS AND GRAPHS [20 marks]**

#### 2.1

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

- Factor:  $(x-1)(x-3)(x-1)(x-3)(x-1)(x-3) \rightarrow x$ -intercepts: x=1x=1 and x=3x=3x=3
- Turning point:  $x=-b2a=42=2x = \frac{-b}{2a} = \frac{4}{2} = 2x=2a-b=24=2$ , y=f(2)=-1y=-1y=f(2)=-1y=f(2)=-1y=f(2)=-1y=f(2)=-1y=f(2)=-1y=f(2)=-1y=f(2)=-
- Domain:  $x \in Rx \in Rx \in R$
- Range:  $y \ge -1y \setminus geq -1y \ge -1$

#### 2.2

 $f(x) = 2x - 5 \Rightarrow x = 2y - 5 \Rightarrow y = x + 52 \Rightarrow f - 1(x) = x + 52f(x) = 2x - 5 \setminus Rightarrow \ x = 2y - 5 \setminus Rightarrow \ y = \int rac\{x + 5\}\{2\} \setminus Rightarrow \ f^{-1}(x) = \int rac\{x + 5\}\{2\} f(x) = 2x - 5 \Rightarrow x = 2y - 5 \Rightarrow y = 2x + 5 \Rightarrow f - 1(x) = 2x + 5 \Rightarrow f - 1$ 

### **QUESTION 3: TRIGONOMETRY [20 marks]**

#### 3.1

 $\frac{\sin[f_0]}{2x + \cos[f_0]} \frac{1}{\sin x \cdot \cos[f_0]} \frac{1}{\sin x \cdot \cos[f_0]} \frac{1}{\sin x \cdot \cos^2 x} \frac{1}{\sin x \cdot \cos^2 x} \frac{1}{\sin x \cdot \cos x} = \frac{1}{\sin x \cdot \cos x} \frac{1}{\sin x \cdot \cos x}$ 

 $2\sin[6\theta]\theta - 1 = 0 \Rightarrow \sin[6\theta]\theta = 12 \Rightarrow \theta = 30 \circ, 150 \circ 2 \sin \theta - 1 = 0 \Rightarrow \sin(1) \{2\} \land \sinh(1) = 30 \land \sin(1) = 30 \land \sin$ 

### **QUESTION 4: CALCULUS [30 marks]**

#### 4.1

 $f(x)=3x3-5x2+2x-7 \Rightarrow f'(x)=9x2-10x+2f(x)=3x^3-5x^2+2x-7 \setminus Rightarrow \ f'(x)=9x^2-10x+2f(x)=3x^3-5x^2+2x-7 \Rightarrow f'(x)=9x^2-10x+2$ 

#### 4.2

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

#### 4.3

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

### **QUESTION 5: GEOMETRY [20 marks]**

#### 5.1

Using Cosine Rule:

BC2=72+52-2(7)(5)cos[fo](60 $\circ$ )=49+25-70(0.5)=74-35=39 $\Rightarrow$ BC=39BC $^2$ 2 = 7 $^2$ 2 + 5 $^2$ 2 - 2(7)(5)\cos(60 $^1$ \circ) = 49 + 25 - 70(0.5) = 74 - 35 = 39 \Rightarrow BC = \sqrt{39}BC2=72+52-2(7)(5)\cos(60 $^1$ )=49+25-70(0.5)=74-35=39 $\Rightarrow$ BC=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  $180^{\circ}$ , opposite angles are supplementary.

Proof may also use:  $\angle A + \angle C = 180 \circ \text{langle } A + \text{langle } C = 180 \circ \text{langle } A + \angle C = 180 \circ$ 

### **QUESTION 6: PROBABILITY & STATISTICS [20 marks]**

#### 6.1

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

 $P(\text{even})=36=12P(\text{text}\{\text{even}\}) = \frac{3}{6} = \frac{1}{2}P(\text{even})=63=21$ 

#### 6.2

Marks: 50, 60, 65, 70, 75

- Median = 65 (middle value)
- Mode = None (all values occur once)

**TOTAL: 150** 

