

MUHANGA DISTRICT

ADVANCED LEVEL COMPREHENSIVE ASSESSMENT

SUBJECT: MATHEMATICS S6

DATE:16/3/2026

COMBITIONS:

- **MATHEMATICS-CHEMISTRY-BIOLOGY (MCB)**
- MATH-PHYSICS-GEOGRAPHY (MPG)**
- PHYSICS-CHEMISTRY-MATHEMATICS (PCM)**
- MATHEMATICS –COMPUTER-ECONOMY (MCE)**
- MATHEMATICS-PHYSICS-COMPUTER (MPC)**
- MATH-ECONOMICS-GEOGRAPHY (MEG)**

DURATION: 3 HOURS

INSTRUCTIONS:

This paper has **2** sections **A** and **B**

SECTION A: Attempt **ALL** questions **(55 marks)**

SECTION B: Attempt any **THREE** questions **(45 marks)**

SECTION A: Attempt all the questions (55 marks)

1. The area bounded by the curves $y = x^2$ and $y = 2x + 3$ is: /4MARKS

- A) 12
- B) 18
- C) 24
- D) 30

2. The volume of the solid formed when the region under $y = \sqrt{x}$ from $x = 0$ to $x = 4$ is revolved about the x-axis is: /4MARKS

A) 8π

B) 16π

C) 32π

D) 64π

3. The work done by a force $F(x) = 3x^2$ as a particle moves from $x = 1$ to $x = 5$ is: /4MARKS

A) 96 J

B) 124 J

C) 150 J

D) 180 J

4. Given the function $f(x) = \frac{e^x - 2}{e^{x+1}}$, the value of $f(-3 \ln 2)$ is /4MARKS

A) $-\frac{3}{5}$

B) $-\frac{5}{3}$

C) $-\frac{5}{8}$

D) $\frac{5}{3}$

5. The length of the arc of the semicubical parabola $y^2 = x^3$ between the points (1, 1) and (4, 8) is /4MARKS

A) $\frac{1}{27}(22\sqrt{22} - 13\sqrt{13})$

B) $\frac{1}{27}(13\sqrt{13} - 22\sqrt{22})$

C) $\frac{1}{27}(8\sqrt{10} - 13\sqrt{13})$

D) $\frac{1}{27}(80\sqrt{10} - 13\sqrt{13})$

6. Determine whether the complex number $3+i\sqrt{2}$ satisfies $x^2-6x+11=0$
/4MARKS

7.a. Determine the order and degree of $x \frac{dy}{dx} + \frac{3}{\frac{dy}{dx}} = y^2$ **/2MARKS**

b. State also if there are linear or non-linear. **/1MARK**

8. Find the average value of the function $f(x) = 1 + x^2$ on the interval $[-1,2]$
/3MARKS

A) -2

B) 3

C) 2

D) $\frac{1}{3}$

9. $f(x) = a^x$ passes through point $(\sqrt{3}, 8)$. the value of a is **/3MARKS**

A) $-2\sqrt{3}$

B) $3\sqrt{2}$

C) $2\sqrt{3}$

D) $2\sqrt{2}$

10. Use the Maclaurin's expansion to calculate

a) $\lim_{x \rightarrow 0} \frac{1 - \cos 4x + x \sin 3x}{x^2}$ **/3MARKS**

b) $\lim_{x \rightarrow 0} \frac{\ln(1+x) - x}{\sin^2 x}$ **/2MARKS**

11. Find the area of the region bounded by the curves $y = \sin x$ and

$y = \cos x$ where $0 \leq x \leq \frac{\pi}{2}$ **/4MARKS**

12. Find the differential equation corresponding to $y^2 = a(b - x^2)$ by eliminating a and b
/4 MARKS

13. Solve $\int \frac{e^x + 1}{e^x - 1} dx$ **/4MARKS**

14. Given the function $f: R \rightarrow R: x \rightarrow \log_x \sqrt{1-x^2}$. Find the domain. / 2MARKS

15. Find the value of c if $\lim_{x \rightarrow \infty} \left(\frac{x+c}{x-c}\right)^x = 3$ /4MARKS

SECTION B; Attempt any three questions

/45 marks

16.

a) Calculate the integral $\int_0^{2\pi} |\sin x| dx$ /5MARKS

b) Using integral rules, Compute the circumference of a circle centred at the origin. /10MARKS

17 a) Show that $y = Ae^{-2x} + Be^x$ is a general solution of the differential equation $y'' + y' - 2y = 0$ and find the particular solution that satisfies the condition $y = y' = 1$ when $x = 0$ /8MARKS

b) Calculate the area of the surface bounded by the curve:

$x = 6(\theta - \sin\theta)$ and $y = 6(1 - \cos\theta)$, where $0 \leq t \leq 2\pi$ /7MARKS

18. Consider the polynomial $P(x) = a_3x^3 + a_2x^2 + a_1x + a_0$, with a_0, a_1, a_2, a_3 coefficients of the polynomial. Given that:

$$P(1+2i) = 0, \quad P(2) = 0, \quad P(0) = 20$$

Determine the coefficients of $P(x)$.

/15 MARKS

19. $f(x) = xe^{-x}$

a) Find the domain of $f(x)$ (1 mark)

b) Determine the party of $f(x)$ (2 marks)

c) Find the intersection points of $f(x)$ (1 mark)

d) Determine the limit on bounding points and asymptotes of $f(x)$ (4 marks)

e) Find the variation tables of $f(x)$ (6 marks)

f) Sketch the graph of $f(x)$ (1 mark)

20. Find the particular solution of the differential equation:

$$7x(x-y)dy = 2(x^2 + 6xy - 5y^2)dx \text{ given that } x = 1 \text{ when } y = 0 \quad /15MARKS$$

Good Luck!!!

