

NATIONAL OPEN UNIVERSITY OF NIGERIA University Village Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi, Abuja

FACULTY OF SCIENCES DEPARTMENT OF MATHEMATICS 2021_2 Examinations...

Course Code:	MTH304
Course Title:	COMPLEX ANALYSIS
Time Allowed:	3 Hours
Total:	70 Marks
Instruction:	Answer Question One (1) and Any Other 4 Questions

- 1a. Suppose the function f given by f(z) = u(x, y) + iv(x, y) has a derivative at $z = z_0 = (x_0, y_0)$. Derive Cauchy Riemann Equations. (8 marks)
- 1b. find all points at z = x + iy which the function f given by $f(z) = x^3 i(1-y)^3$ is differentiable. (8 marks)
- 1c. If z=x+jy, find the locus defined as |z|=5. (6 marks)

2a. If $z = \frac{1}{2-j3} + \frac{1}{1-j2}$ express z in terms of $a + jb$	(4 marks)
2b. Write in polar form $re^{i\theta}$ (i) $3 + 4j$ (ii) $12 + 5j$	(4 marks)

- 2c. If z = x + iy, find the equation of the locus $\left|\frac{z+1}{z-1}\right| = 2$ (4 marks)
- 3a. What is a vector valued function?(4 marks)
- 3b. Find a polar form of $(1 + i)(1 + i\sqrt{3})$ (4 marks)
- 3c. Suppose $f(z) = 2z^2$. What is $\lim_{z \to 0} \frac{f(z) f(z_0)}{z z_0}$ (4 marks)

4a. (i) What are conjugates?

(ii)
$$(u, v) + (a, v) = (x, y)$$
 (iii) $(8,1) + (x, y) = (10,1)$ (2 marks)

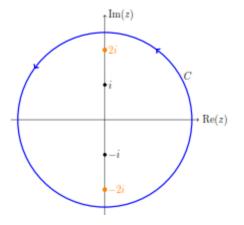
4b. i. What are the products of the following? (2 marks)

(ii)
$$(4+3j)(4-3j)$$
 (iii) $(x-jy)(x+jy)$ (2 marks)

4c. When are two complex numbers said to be equal? (4 marks)

5a. Let c be the circle $ z =4$. Evaluate the integral $\int_c \frac{\cos z}{z^2-6z+5} dz$	(4 marks)
5b. Define Cauchy integral formula	(4 marks)
5c. if $z = x + jy$, find the equation of the locus $\arg(z^2) = -\frac{\pi}{4}$	(4 marks)

6a. Find the
$$\lim_{x\to 0} \left\{ \frac{\tan x - x}{x^3} \right\}$$
(4marks)(46b. What Is an entire function?(46c.Compute $\int_C \frac{1}{z^2 + 4} dz$ over the contour C shown below(4(4marks)



(2 marks)