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The Open University of Sri Lanka

B.Sc/B.Ed. Degree Programme

Open Book Test (OBT) – 2024/2025

Pure Mathematics – Level 05

PEU5304 – Introduction to Complex Analysis

Duration: - One Hour.

Date: 25.08.2024 **Time: 10.30 AM – 11.30 AM**

Answer All Questions

1. Express the following complex numbers in the standard form $x + iy$, where $x, y \in \mathbb{R}$ and $i^2 = -1$.

   (a) $\frac{1+i}{1-i} - (1+2i)(2+2i) + \frac{3-i}{1+i}$,

   (b) $2i(i-1) + \left(\overline{\sqrt{3}+\imath}\right)^3 + (1+i)(\overline{1+\imath})$, where $\overline{x+\imath y}$ is the conjugate of $x + iy$.

2. (a). Find the real part and the imaginary part of the complex number $z = \frac{i-4}{2i-3}$.

   (b). Suppose z is a pure imaginary number such that $z^2 = z$. Find z.

3. Find all the complex number z that satisfies the equation $\left|\frac{z-12}{z-8i}\right| = \frac{5}{3}$ and $\left|\frac{z-4}{z-8}\right| = 1$, where $z = x + iy$ with $x, y \in \mathbb{R}$ and $i^2 = -1$.

THE OPEN UNIVERSITY OF SRI LANKA

B.Sc/B.Ed Degree Programme

Applied Mathematics – Level 03

ADE3200 – Applied Calculus I

OPEN BOOK TEST (OBT) – 2024/2025

DURATION: ONE (01) HOUR

Date: 01.09.2024. **Time: 1.00 p.m.- 2.00 p.m.**

ANSWER **ALL** QUESTIONS.

1. a) Derive the equation of a **quadratic function** $f(x)$, whose graph has the following characteristics:
   - It **opens down** and **stretched** by a factor of 2;
   - Its **axis of symmetry** is the line $x = 1$;
   - It passes through the point (4, -2).

   [60 marks]

   b) Clearly stating the steps involved, and using suitable transformations of functions, sketch the graph of the quadratic function $f(x)$ derived in part a).

   [40 marks]

   [Total 100 marks]

2. Consider the function $f(x) = \frac{x-3}{x^2+x-2}$.

   a) Sketch the graph of the rational function $f(x)$. [40 marks]

   b) Find the domain and the range of $f(x)$. [20 marks]

   c) Write the equation(s) of the vertical asymptote(s). [20 marks]

   d) Find $\lim_{x\to\infty} f(x)$ and $\lim_{x\to-\infty} f(x)$. [20 marks]

   [Total 100 marks]

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