The Open University of Sri Lanka
B.Sc/ B.Ed Degree Programme
No Book Test (NBT) - 2024/2025
Pure Mathematics – Level 03
PEU3301 – Foundations of Mathematics

DURATION: ONE HOUR

Date: 15.03.2025 **Time: 1.00 p.m. – 2.00 p.m.**

ANSWER **ALL** QUESTIONS.

1. Let $x, y \in \mathbb{R}$. Prove that if $0 < x < y$, then $\frac{1}{x} > \frac{1}{y}$.

2. Let x be a positive rational number. Using the *principle of mathematical induction*, prove that for each $n \in \mathbb{N}$, if x is even then x^n is even.

3. Solve the inequality $\frac{1+x}{1-x} > \frac{2-x}{2+x}$ for $x \in \mathbb{R}$.

4. The set $(-1, 1)$ has a maximum. Prove or disprove the statement.

5.
   i. Is $\sqrt{3} - \sqrt{2}$ algebraic? Justify your answer.

   ii. Let α be a positive non-zero transcendental number. Prove that $-\left(\frac{1}{\alpha}\right)$ is a transcendental number.

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