MATH 2001 DISCRETE MATHEMATICS
WEEK 3 QUIZ
2026 JANUARY 30

Problem S1-1

Find the least element of

$$\left\{ x \in \mathbb{N} \;\middle|\; x^2 - 3 \in \mathbb{N} \right\}.$$

(Show some work to explain your answer.)

Problem S1-2

Compute the cardinality of $A \cap (B \cup C)$ where

$$A = \{ n \in \mathbb{N} \mid 3 \leq n \leq 10 \},$$
$$B = \left\{ x \in \mathbb{R} \;\middle|\; x^2 \leq 6 \right\},$$

and

$$C = \{ n \in \mathbb{N} \mid 2^n \geq 256 \}.$$

(Show some work to explain your answer.)

Problem S2-1

Let $f\colon \mathbb{N} \to \mathbb{N}$ be given by

$$f(n) = \begin{cases} n+1 & \text{when } n \text{ is even} \\ n-1 & \text{when } n \text{ is odd} \end{cases}.$$

Is f injective, surjective, both, or neither? Explain your reasoning.

Problem S2-2

Let $A = \{1, 2, 3, 4, 5\}$ and let $B = \{ 2^n \in \mathbb{N} \mid n \in \mathbb{N} \}$. Define $g\colon A \to B$ by the rule $g(x) = 2^x$.

a. Find the image of g.

b. Let $Y = \{ b \in B \mid b \geq 10 \}$. List the elements of $g^{-1}(Y)$.