

## MATH 2010 SPRING 2026 GRADED HOMEWORK #2

*Write clearly, on separate paper. All questions carry equal weight.  
You will receive credit for your three best answers.*

- (1) Find the inverse of the function  $f: \mathbb{R} \setminus \{-3\} \rightarrow \mathbb{R} \setminus \{2\}$  with

$$f(x) = \frac{2x + 5}{x + 3}.$$

- (2) Prove or disprove:

**Proposition.** The set  $D = \{\{m, n\} \subset \mathbb{N} \mid m \neq n\}$  of two-element subsets of  $\mathbb{N}$  is countable.

- (3) Prove or disprove:

**Proposition.** The power set  $\mathcal{P}(\mathbb{Q})$  of  $\mathbb{Q}$  is countable.

- (4) Prove or disprove:

**Proposition.** Let  $(S, <)$  be a (totally) ordered set. Let  $E$  be a nonempty subset of  $S$  for which  $\inf E$  and  $\sup E$  exist. Then  $\inf E < \sup E$ .