

MATH 245 S21, Exam 1 Questions

(60 minutes, open book, open notes)

1. (Question 1 is just instructions; this is a weird requirement of Gradescope)
2. Prove or disprove: If a is an even integer, then $\frac{a^3}{4}$ must be even.
3. Let p, q be propositions. Simplify the following expression as much as possible (where only basic propositions are negated): $\neg(p \leftrightarrow q)$.
4. Let p, q, r, s be propositions. Prove $p \rightarrow (q \vee r), q \rightarrow s, r \rightarrow s \vdash p \rightarrow s$.
5. Prove or disprove: For all $p \in \mathbb{N}$, if p^2 is prime then p is prime.
6. Prove or disprove: $\forall x \in \mathbb{N}, \exists y \in \mathbb{Q}, |x - y| = |y|$.
7. Prove or disprove: $\forall x \in \mathbb{N}, \exists y \in \mathbb{N}, |x - y| = |y|$.