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 $p \rightarrow (q \lor r), q \rightarrow s, r \rightarrow s \vdash p \rightarrow s$.

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: $\forall x \in \mathbb{N}, \exists y \in \mathbb{N}, |x - y| = |y|$.