

HW #6

Student: _____
ID #: _____

You must work alone on your homework, and homework must be **written legibly**, single-sided on your own lined paper, **or typed**, with the answers clearly labeled and in the sequential order as assigned. You must write your name and university ID number in the upper right-hand corner of your homework. Staple all pages together and be sure that your name appears on every sheet.

1. (5 points) Write your name clearly on each page. Write the time and place of Exam 2.
2. (20 points) Prove $\forall a, b, c \in \mathbf{Z}: (a \equiv_m b \wedge b \equiv_m c) \rightarrow a \equiv_m c$.
3. (20 points) Is the following true: $\forall x \in \mathbf{Z}: x^2 \in \mathbf{Z}^{\text{even}} \rightarrow x \in \mathbf{Z}^{\text{even}}$. Prove your position.
4. (25 points) Prove that $\sqrt{3}$ is irrational.
5. (10 points) Explain why this proof does not work for $\sqrt{4}$. Show where the proof “breaks down”.
6. (20 points) If m, n, a, b and d are integers and $m \bmod d = a$ and $n \bmod d = b$, is $(mn) \bmod d = (ab) \bmod d$? Prove your answer.
7. **(No points will be awarded for this assignment unless this is done)** Sign your name to the following honor code statement: “I pledge on my honor that I have not given or received any unauthorized assistance on this assignment”.