Transition to Mathematical Proofs
Chapter 4 - Sets of Real Numbers Assignment

INSTRUCTIONS: For the below questions, show all of your work. For the proofs, be sure that you

(i) write a complete proof in full English sentences;
(ii) if hand-writing, write legibly and clearly.

NOTE: Discussion sections are no longer required. You may, of course, include them in your assignments, as they may help the grader give more helpful feedback.

Question 1. Let $a, b \in \mathbb{Z}$. Show that $4 \mid a^2 - b^2$ if and only if a and b are of the same parity.

Question 2.

(a) Let $a \in \mathbb{Z}$. Show that $3 \mid a$ if and only if $3 \mid a^2$.

(b) Use (a) to show that $\sqrt{3}$ is irrational.

Question 3. Let $a, b \in \mathbb{R}$. Show that if $a + b$ is rational, then a is irrational or b is rational.