Directions: You may work to solve these problems in groups, but all written work must be your own. **Show your work**; See "Guidelines and advice" on the course webpage for more information.

1. At a party with n people, every person shakes hands with every other person.

   (a) For $n = 2$, $n = 3$, $n = 4$, and $n = 5$, how many handshakes are there?

   (b) Find a formula for the total number of handshakes. Justify your answer.

2. [S 3.3.7.2] Consider the set $S = \{3, 4, 5, 6\}$. Define S in two different ways using set-builder notation.

3. [S 3.3.7.5] Give an example of sets A, B, C such that $A \in B$, $B \in C$, but $A \notin C$.

4. Let A, B, and C be sets. Prove that if $A \subseteq B$ and $B \subseteq C$, then $A \subseteq C$.

5. [S 3.3.7.6] Write a definition of the set of odd integers using set-builder notation. (Note: -1 is an odd integer.)

6. [S 3.3.7.8] Let $A = \{x \in \mathbb{R} \colon x^2 - 3x + 2 \geq 0\}$ and $B = \{y \in \mathbb{R} \colon y \leq 1 \text{ or } y \geq 2\}$. Prove that $A = B$.

7. [S 3.3.7.9] Let $C = \{x \in \mathbb{R} \colon x^2 - 4 \geq 0\}$ and $D = \{y \in \mathbb{R} \colon y \geq 2\}$. Is $C = D$? Why or why not? Write your explanation with good mathematical notation, using $\in$ and $\notin$.

8. Find a real number x such that $x > 1$ and $x + \frac{1}{x}$ is an integer.