1. Consider the sets $A = \{n \in \mathbb{N} : n \text{ is odd and } n < 20\}$, $B = \{n \in \mathbb{Z} : |n| \leq 10\}$, and $C = \{n^2 - 4n : n \in \mathbb{Z}\}$.
   (a) Write down all of the elements in the following sets.
   \[
   A \setminus B = \quad A \setminus C = \quad B \cap C =
   \]
   (b) Determine whether or not the identity above holds for any three sets; that is, if $A$, $B$, $C$ are any three sets, prove or disprove that
   \[
   (A \setminus B) \cup (A \setminus C) = A \setminus (B \cap C).
   \]

2. Consider the function $f : \mathbb{Z} \to \mathbb{Z}$ given by $f(n) = n + (-1)^n + 2$. Determine whether or not $f$ is surjective. Justify your conclusion.

3. (a) Prove that the function $g : [0, 1] \to [-1, 1]$, given by $g(x) = -2x + 1$, is invertible/bijective.
   (b) Explain why the function $h : \mathbb{Z} \to \mathbb{Z}$, given by $h(x) = -2x + 1$ is not invertible.

4. Consider the set $P = \{\lfloor 4x \rfloor - 4\lfloor x \rfloor : x \in [2, 3]\}$.
   (a) Show that $P$ is a finite set and list the element(s) of $P$.
   (b) Determine which (if any) of the elements $x \in [2, 3]$ satisfy $\lfloor 4x \rfloor \neq 4\lfloor x \rfloor$.

5. Define the sequence $a_n$ for $n \geq 0$ recursively by
   \[
   a_0 = 4 \quad \text{and} \quad a_n = 2a_{n-1} - 3n + 1.
   \]
   (a) Find the next 4 terms of the sequence $\{a_n\}$, namely for $1 \leq n \leq 4$.
   (b) For each integer $n \geq 0$, define the sequence $s_n$ by
   \[
   s_n = \sum_{j=0}^{n} a_j.
   \]
   Find the first 5 terms of the sequence $\{s_n\}$, namely for $0 \leq n \leq 4$.  