CSC 320 FALL 2024
FOUNDATIONS OF COMPUTER SCIENCE
UNIVERSITY OF VICTORIA
ASSIGNMENT 1

1. Examine the following formal descriptions of sets and write a short informal English description of each.
   a) $\{2,4,6,8,\dots\}$
   b) $\{\dots,-5,-3,-1,1,3,5,\dots\}$
   c) $\{n|n = 2m + 1 \text{ for some } m \in \mathcal{N}\}$
   d) $\{n|n \in \mathcal{Z} \text{ and } n \neq n + 1\}$

2. Write formal descriptions of the following sets.
   a) The set of all strings of 0's and 1's that end with a 00
   b) The set of all strings of 0's and 1's of length less than 4
   c) The intersection of the sets $\{0,1\}^*$ and $\{a,b\}^*$
   d) The intersection of the sets $\{0,1\}^+$ and $\{a,b\}^*$

3. Find $\mathcal{P}(A)$ and $|\mathcal{P}(A)|$ for each of the following sets.
   a) $A = \{1,2\}$
   b) $A = \{\emptyset, 1, \{a\}\}$
   c) $A = \{0, \emptyset, \{\emptyset\}\}$
   d) $A = \mathcal{P}(\{1\})$

4. Let A and B be sets such that A is a subset of B.
   a) If B is countable, then A is countable. In your own words explain why this is true. I am not asking you to prove this, I just want you explain why you think it makes sense.
   b) Prove that if A is uncountable, then B is uncountable. You may use a) to do this and I am asking you to prove this one.

5. A *palindrome* can be defined as a string that reads the same forward and backward. You can also define a palindrome as follows:
   i.   The empty string, ε, is a palindrome.
   ii. If $a \in \Sigma$, then string a is a palindrome.
   iii. If $a \in \Sigma$ and $w \in \Sigma^*$ is a palindrome, then awa is a palindrome.
   Prove by induction that the two definitions are equivalent.