Name:
Section:

Sequences and Series Lab

Introduction
A *sequence* is an ordered list of numbers; the numbers in this ordered list are called *elements* or terms. A *series* is a sum of the terms of a sequence, which we call the *sum*. For instance, $\{1, 2, 3, ...\}$ is an example of an *infinite* sequence whose terms start at 1 and go up by 1 each term without end. On the other hand the $\{2, 4, 6, 8\}$ is an example of a *finite* sequence since it has finitely many terms. Correspondingly we can find the sum of these sequences as

$$1 + 2 + 3 + 4 + 5 + ... = \sum_{n=1}^{\infty} n$$

and

$$2 + 4 + 6 + 8 = \sum_{n=1}^{4} 2n$$

In general it is customary to denote an infinite sequence or series of terms as $\{a_i\}_{i=1}^{\infty} = \{a_1, a_2, a_3, a_4, ...\}$ and $\sum_{i=1}^{\infty} a_i = a_1 + a_2 + a_3 + ...$, while denoting a finite sequence or series of terms as $\{a_i\}_{i=1}^{n} = \{a_1, a_2, a_3, ..., a_n\}$ and $\sum_{i=1}^{n} a_i = a_1 + a_2 + a_3 + ... + a_n$. In the above finite case we had $n = 4$ terms, which were $a_1 = 2$, $a_2 = 4$, $a_3 = 6$ and $a_4 = 8$. We were able to express any term as a function of its place in the sequence, namely we said $a_k = 2k$. Notice the relationship here between the index of a_k and the term $2k$. Ideally we would like to be able to write a sequence or series in its most compact form since determining properties like convergence are much easier to find if we know the form of the general term or a_n. However, it is not always guaranteed that we can write the general form as a function of its index or place in the sequence as we will soon see.

Exercises:

Directions I_1 and I_2: Find the relationship between the terms and their place value or index then write the sequence or series in its most compact form, e.g. In the above example the infinite sequence could be written compactly as $\{n\}_{n=1}^{\infty}$ and the finite sequence as $\{2n\}_{n=1}^{4}$. Note that we have already written their corresponding series compactly. If no relationship exists then state as much.

I_1 (a) $3, 6, 9, 12, ...$

(b) $6, 9, 12, 15, 18, ..., 33$

(c) $2, -4, 6, -8, 10, ..., 20$ (We call a sequence of this type an alternating sequence since the signs *alternate* between terms).