Name:

"Knowledge is what is left over after you have forgotten everything else."

Please answer the following questions which relate to material we will be using in our course this term and which you might (or might not) have seen in other math classes. Do not worry if there are questions you do not know how to do. By the end of the semester you will know how to do them. This assessment will not be counted towards your grade but will help me in organizing our class. No calculators. Do not consult any materials.

For each question, also circle the appropriate number 1 to 4 where

1 indicates you have not seen this topic before
2 indicates you have seen topic but did not understand it
3 indicates you have seen topic, understood it at one point but have forgotten it
4 indicates you have seen topic and remember how to do it

1. Determine

$$\lim_{n \to \infty} 2 + \frac{1}{n} =$$

$$\lim_{n \to \infty} \frac{3n + 7}{2n + 4} =$$

Circle: 1 2 3 4

2. Consider the following sequence of numbers:

$$1, -2, 3, -4, 5, -6, 7, -8, \ldots$$

If we denote the elements in the sequence by \(a_1, a_2, a_3, a_4, \ldots\), give the formula for \(a_n\).

\[a_n =\]

Circle: 1 2 3 4
3. What does the following sum, written using summation notation, equal?

\[
\sum_{k=1}^{5} k =
\]

Circle: 1  2  3  4

4. Prove, using mathematical induction, that the following statement is true for all real numbers \( n = 1, 2, 3, \ldots \).

\[
\sum_{k=1}^{n} k = \frac{n(n + 1)}{2}.
\]

Circle: 1  2  3  4
5. What is the definition of a sequence of real numbers $a_1, a_2, a_3, \ldots, a_n, \ldots$ converging to a limit $L$?

6. Show that the set of even integers, $2, 4, 6, 8, \ldots$ is a countable set.

7. Consider the function $y = f(x)$. Give the $\epsilon - \delta$ definition for the function to be continuous at a point $x_0$. Illustrate with a picture.