PROBLEM 1. In what sense is $\sum_{n=0}^{\infty} i^n$ a sequence? Draw this sequence in the complex plane.

PROBLEM 2. Let $\{a_n\}$ be a sequence of real numbers.

(a) Critique the statement that $\sum_{n=0}^{\infty} a_n$ is convergent if and only if its sequence of partial sums is bounded. Give a proof or a counterexample for both implications.

(b) Does anything change if $\{a_n\}$ is a sequence of *nonnegative* real numbers?

PROBLEM 3. Determine whether the following series converge, and in the case one does, find its sum. If the sum is complex, express the answer in the form $a + bi$ with $a, b \in \mathbb{R}$.

$$(a)\ \sum_{n=2}^{\infty}(-1)^n \frac{3^{2n+2}}{10^n} \qquad \text{(b)}\ \sum_{n=0}^{\infty}\left(\frac{2+i}{2}\right)^n \qquad \text{(c)}\ \sum_{n=0}^{\infty}\left(\frac{3+i}{5}\right)^n.$$

PROBLEM 4. Express $0.99999\ldots$ as a geometric series, and sum the series. Do the same for $6.232323\ldots$ to express this number as a quotient of integers.

PROBLEM 5. Sum the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n(n+2)}$.