1. (5 points)

(a) Find a formula for \( a_n \), the \( n^{th} \) term of the sequence \( \{1, -\frac{2}{3}, \frac{4}{9}, -\frac{8}{27}, \ldots\} \).

(b) Determine whether the sequence is convergent or divergent. If it is convergent, find its limit.
2. (5 points) Determine whether the series \( \sum_{n=1}^{\infty} \frac{n}{n^2 + 1} \) converges or diverges.