1. [5 points] Let \( a_n \) be a sequence of positive numbers such that \( \sum_{n=1}^{\infty} a_n = 4 \), and let \( S_n \) be a sequence defined by \( S_n = a_1 + a_2 + \cdots + a_n \). No justification necessary.

a. [2 points] Find the following limits. Write DNE if the limit does not exist or is \( \infty \) or \( -\infty \).

   i. \( \lim_{n \to \infty} a_n = \quad \)
   
   ii. \( \lim_{n \to \infty} S_n = \quad \)

b. [3 points] Circle all statements which must be true.

   i. \( a_n \) is increasing
   
   ii. \( a_n \) is decreasing

   iii. \( S_n \) is increasing
   
   iv. \( S_n \) is decreasing

   v. \( S_n \) is bounded
   
   vi. None of these

2. [5 points] Calculate \( \int_{0}^{\infty} \frac{2}{1 + x^2} \, dx \). Show all your work using correct notation. Evaluation of integrals must be done without a calculator.