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. $\lim_{n \to \infty} a_n = \underline{\phantom{0}}$
   ii. $\lim_{n \to \infty} S_n = \underline{\phantom{0}}$

   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.