

4. [8 points] Suppose a_n and b_n are sequences of positive numbers, defined for $n = 1, 2, 3, \dots$, satisfying the following conditions:

- $a_n \leq \frac{1}{n^{1/2}}$
- $b_n \geq \frac{1}{n}$

For each statement below, circle ALWAYS if the statement is always true, SOMETIMES if the statement can be true or false depending on the specifics of a_n or b_n , and NEVER if the statement is false for all specific a_n or b_n .

a. [1 point] $\lim_{n \rightarrow \infty} a_n = 0$.

ALWAYS

SOMETIMES

NEVER

b. [1 point] $\lim_{n \rightarrow \infty} b_n = 0$.

ALWAYS

SOMETIMES

NEVER

c. [1 point] a_n is bounded.

ALWAYS

SOMETIMES

NEVER

d. [1 point] b_n is monotone.

ALWAYS

SOMETIMES

NEVER

e. [1 point] $\sum_{n=1}^{\infty} a_n$ converges.

ALWAYS

SOMETIMES

NEVER

f. [1 point] $\sum_{n=1}^{\infty} b_n$ converges.

ALWAYS

SOMETIMES

NEVER

g. [1 point] $\sum_{n=1}^{\infty} (-1)^n b_n$ converges.

ALWAYS

SOMETIMES

NEVER

h. [1 point] $\sum_{n=1}^{\infty} (-1)^n a_n$ converges.

ALWAYS

SOMETIMES

NEVER