

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