

8. [12 points] For the following questions, determine if the statement is ALWAYS true, SOMETIMES true, or NEVER true, and circle the corresponding answer. Justification is not required.

a. [2 points] If a sequence a_n is monotone and bounded, then it converges.

Circle one: **ALWAYS** **SOMETIMES** **NEVER**

b. [2 points] If a sequence b_n is bounded, then it is monotone.

Circle one: **ALWAYS** **SOMETIMES** **NEVER**

c. [2 points] Let c_n be a sequence and $g(x)$ be a function with $g(n) = c_n$ for all $n \geq 1$. If $\int_1^\infty g(x) dx$ diverges, then $\sum_{n=1}^\infty c_n$ diverges.

Circle one: **ALWAYS** **SOMETIMES** **NEVER**

d. [2 points] The sequence d_n has $d_n \geq 0$ for $n \geq 1$. If $\lim_{n \rightarrow \infty} d_n = 0$, then $\sum_{n=1}^\infty (-1)^n d_n$ converges.

Circle one: **ALWAYS** **SOMETIMES** **NEVER**

e. [2 points] If $a > 0$, then the series $\sum_{n=1}^\infty \ln(n^a)$ converges.

Circle one: **ALWAYS** **SOMETIMES** **NEVER**

f. [2 points] The sequence k_n has $k_n > 0$ for all $n \geq 1$. If $\sum_{n=1}^\infty k_n$ converges, then $\sum_{n=1}^\infty \ln(k_n)$ converges.

Circle one: **ALWAYS** **SOMETIMES** **NEVER**