

2. [8 points] Suppose that  $a_n, b_n$ , and  $c_n$  are sequences with the following properties:

- The sequence  $a_n$  is bounded
- The series  $\sum_{n=1}^{\infty} b_n$  converges absolutely
- $\frac{1}{n^2 + 1} \leq c_n \leq \frac{1}{n}$  for all  $n \geq 1$

Determine whether the following statements are **always**, **sometimes**, or **never** true, and circle the appropriate answer for each part. No justification is necessary.

a. [2 points] The sequence  $b_n$  converges to 0.

Circle one: **Always** **Sometimes** **Never**

b. [2 points]  $\sum_{n=1}^{\infty} \frac{c_n}{n}$  diverges.

Circle one: **Always** **Sometimes** **Never**

c. [2 points] The sequence  $a_n$  converges.

Circle one: **Always** **Sometimes** **Never**

d. [2 points] The series  $\sum_{n=1}^{\infty} \frac{1}{n^3 c_n}$  converges.

Circle one: **Always** **Sometimes** **Never**