4. [9 points] Consider the following sequences, all defined for $n = 1, 2, 3, \ldots$

$$a_n = \int_1^n \frac{1}{x^2} \, dx$$
$$b_n = 1 + \frac{(-1)^n(n + 1)}{n^2}$$
$$c_n = \sum_{k=1}^n \frac{1}{(k + 1)^{0.5}}$$

a. [3 points] Which sequences are monotone? No justification is required for this part of the problem. Circle your final answer(s) below.

*Circle your answers:* $\boxed{a_n} \quad \boxed{b_n} \quad \boxed{c_n} \quad$ NONE

b. [3 points] Which sequences are convergent? No justification is required for this part of the problem. Circle your final answer(s) below.

*Circle your answers:* $\boxed{a_n} \quad \boxed{b_n} \quad \boxed{c_n} \quad$ NONE

c. [3 points] Does the series $\sum_{n=1}^\infty a_n$ converge? Justify your answer.

*Solution:* Note that

$$\lim_{n \to \infty} a_n = \lim_{n \to \infty} \int_1^n \frac{1}{x^2} \, dx = \int_1^\infty \frac{1}{x^2} \, dx.$$ 

This integral converges to a nonzero number. By the nth term test for divergence, the series $\sum_{n=1}^\infty a_n$ diverges.