- 11. [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] Let F(x) be a cumulative distribution function (cdf) that is continuous for all x. Then, the series $\sum_{n=1}^{\infty} (-1)^n (1 F(n))$ converges.

Circle one: ALWAYS SOMETIMES NEVER

- **b.** [2 points] Let f(x) be a non-negative, continuous function for all $x \ge 1$, and suppose that f(x) is decreasing. Then, the integral $\int_{1}^{\infty} \frac{f(x)}{x} dx$ converges. *Circle one:* **ALWAYS SOMETIMES NEVER**
- c. [2 points] Let g(x) be a continuous function and suppose that for all n, $s_n = g(n)$. If $\int_1^\infty g(x) \, dx$ diverges, then $\sum_{n=1}^\infty s_n$ also diverges.

Circle one: ALWAYS SOMETIMES NEVER

- d. [2 points] Let h(x) be a non-negative, continuous function for all x, and suppose that h(x) is decreasing. Let $a_n = h(n)$ for all n. If $\int_1^\infty xh(x) \, dx$ converges, then the series $\sum_{n=1}^\infty a_n$ also converges. Circle one: **ALWAYS SOMETIMES NEVER**
- e. [2 points] Let $b_n \ge 0$ and $c_n \ge 0$ for all n. Suppose that the series $\sum_{n=1}^{\infty} b_n$ converges and that the sequence c_n also converges. Then, the series $\sum_{n=1}^{\infty} b_n 2^{c_n}$ diverges. *Circle one:* **ALWAYS SOMETIMES NEVER**
- **f.** [2 points] Suppose that d_n is a monotonic decreasing sequence of positive numbers that converges to 0. Furthermore, assume that $\lim_{n\to\infty} \frac{d_n}{1/n^2} = 5$. Then, the series $\sum_{n=1}^{\infty} (-1)^n d_n$ is conditionally convergent.

Circle one: ALWAYS SOMETIMES NEVER