10. [12 points]

a. [6 points] For each of the following sequences or series below, determine whether they must converge, must diverge, or whether there is not enough information. Circle your answers. No justification is required.

(i) $a_n = \displaystyle\int_1^n f(x)\,dx$ where $f(x) \geq 0$, $f'(x) \leq 0$, and $\lim_{x\to\infty} f(x) = 0$.

Circle one: **Converges** **Diverges** **Not Enough Information**

(ii) $\displaystyle\sum_{n=1}^{\infty}(-1)^n(1+s^{-n})$ where s is a positive real number.

Circle one: **Converges** **Diverges** **Not Enough Information**

(iii) $\displaystyle\sum_{n=1}^{\infty}\frac{\sin n}{k^n}$ where k is a real number with $k > e$.

Circle one: **Converges** **Diverges** **Not Enough Information**

b. [6 points] For each of the following sequences, defined for $n \geq 1$, decide whether the sequence is monotone increasing, monotone decreasing, or not monotone, and whether it is bounded or unbounded. Circle your answers. No justification is required.

(i) $b_n = \dfrac{(-1)^n}{2n}$

*Circle **all** which apply:*

Monotone Increasing **Monotone Decreasing** **Not Monotone**

Bounded **Unbounded**

(ii) $c_n = e^n \cos\left(\dfrac{1}{n}\right)$

*Circle **all** which apply:*

Monotone Increasing **Monotone Decreasing** **Not Monotone**

Bounded **Unbounded**

(iii) $d_n = \displaystyle\int_2^{2n} \frac{1}{(x-1)^2}\,dx$

*Circle **all** which apply:*

Monotone Increasing **Monotone Decreasing** **Not Monotone**

Bounded **Unbounded**