6. [12 points]

a. [6 points] For each of the following sequences or series described below, defined for $n \geq 1$, determine whether they must converge, must diverge, or whether there is not enough information. Circle your answers. No justification is required.

(i) $a_n = (-1)^n(2 + k^{-n})$, where k is a positive real number.

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

(ii) $b_n = \displaystyle\int_2^{n+3} f(x)\,dx$ where $f(x)$ is a positive function, and the series $\displaystyle\sum_{j=2}^{\infty} f(j)$ converges.

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

(iii) $c_n = P(e^n)$ where $P(x)$ is a cumulative distribution function.

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) $r_n = \cos(2\pi n)\left(\dfrac{5}{4}\right)^n$

*Circle **all** which apply:*

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

Bounded **Unbounded**

(ii) $s_n = \dfrac{(-1)^n}{1 + \ln(n)}$

*Circle **all** which apply:*

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

Bounded **Unbounded**

(iii) $t_n = \displaystyle\int_1^{n^3} 2^{-x}\,dx$

*Circle **all** which apply:*

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

Bounded **Unbounded**