3. [13 points] Consider the following sequences, each defined for $n \geq 1$:

$$a_n = \frac{\cos(\pi n)}{n} \qquad b_n = -\left(\frac{100}{99}\right)^n \qquad c_n = \sum_{k=0}^{n} \frac{1}{3^k}$$

a. [9 points] For each of the sequences above, determine whether the sequence is bounded, whether it is monotone, and whether it is convergent. No justification is required.

(i) The sequence a_n is...

Circle one: **Bounded** **Unbounded**

Circle one: **Monotone** **Not Monotone**

Circle one: **Convergent** **Divergent**

(ii) The sequence b_n is...

Circle one: **Bounded** **Unbounded**

Circle one: **Monotone** **Not Monotone**

Circle one: **Convergent** **Divergent**

(iii) The sequence c_n is...

Circle one: **Bounded** **Unbounded**

Circle one: **Monotone** **Not Monotone**

Circle one: **Convergent** **Divergent**

b. [4 points] Determine whether the following series is convergent or divergent. **Fully justify** your answer including using **proper notation** and **showing mechanics** of any tests you use. Circle your final answer choice.

$$\sum_{n=0}^{\infty} c_n$$

Circle one: **Convergent** **Divergent**