1. [11 points] Parts **a.** and **b.** are unrelated. You do not need to justify your answers.

a. [8 points] Consider the following sequences, defined for all $n \geq 1$.

$$a_n = 3(0.999)^n$$

$$b_n = \sum_{k=1}^{n} 3(0.999)^k$$

$$c_n = \int_1^n 3 - \frac{1}{x}\, dx$$

$$d_n = \cos(\pi n)$$

For each of the following, circle all sequences that satisfy the given property.

(i) Which sequences are bounded?

$\boxed{a_n}$ $\boxed{b_n}$ c_n $\boxed{d_n}$

(ii) Which sequences are increasing?

a_n $\boxed{b_n}$ $\boxed{c_n}$ d_n

(iii) Which sequences are decreasing?

$\boxed{a_n}$ b_n c_n d_n

(iv) Which sequences converge?

$\boxed{a_n}$ $\boxed{b_n}$ c_n d_n

b. [3 points] Write out the first 3 terms of the power series $\sum_{n=1}^{\infty} \frac{(5x)^{2n}}{n^p}$, where p is a positive constant.

Answer: $(5x)^2, \frac{(5x)^4}{2^p}, \frac{(5x)^6}{3^p}$