2. [13 points] Determine if each of the following sequences is increasing, decreasing or neither, and whether it converges or diverges. Circle all the answers that apply. On parts **a**-**c**, if the sequence converges, find the limit. No justification is required.

a. [3 points] For $n \geq 1$, let $a_n = 3 + \frac{1}{n}$.

b. [3 points] For $n \geq 1$, let $a_n = (-\frac{\pi}{e})^n$.

c. [3 points] Let $P(x)$ be the cumulative distribution function of a nonzero probability density function $p(x)$. Define $a_n = P(n)$ for $n \geq 1$.

d. [2 points] For $n \geq 1$, let $a_n = 1 - \dfrac{1}{1!} + \dfrac{1}{2!} - \dfrac{1}{3!} + \cdots + \dfrac{(-1)^n}{n!}$.

e. [2 points] Let $a_n = \displaystyle\int_2^n \frac{1}{\sqrt{x}-1}dx$, for $n \geq 2$.