2. [4 points] Let $a_n = \sum_{k=1}^{n} \frac{1}{k}$. Circle all of the statements given below that are true about the sequence a_n and *briefly* explain your answers.

-successive values of the sequence a_n increase in magnitude

-successive values of the sequence a_n decrease in magnitude

-successive values of the sequence a_n may increase or decrease in magnitude

-the sequence a_n converges

-the sequence a_n diverges

-it is not possible to determine whether sequence a_n converges or diverges

Solution: For any n, we have $a_{n+1} = a_n + \frac{1}{n+1}$, so successive values of the sequence a_n increase in magnitude. Then as $n \to \infty$, $a_n \to \sum_{k=1}^{\infty} \frac{1}{k}$, which diverges.