Big Question:

Given any series $\sum_{k=0}^{\infty} a_k$, how do we determine whether or not the series converges? If it converges, how do we determine what it converges *to*, or is that even possible?

Methods we have so far:

- Is $\sum_{k=0}^{\infty} a_k$ a **geometric series**?

  If so, we can not only determine whether or not the series converges, but exactly what it converges to.

- Does $\lim_{k\to\infty} a_k = 0$? If so, then our results are inconclusive, but if $\lim_{k\to\infty} a_k \neq 0$, then by **the kth term test**, we know the series diverges.

Determine whether the following series converge or diverge, by drawing a picture that compares each series to an improper integral in a useful way. Think Riemann Sums. (Don't use the statement of the integral test - this is to help understand the integral test).

1. $\displaystyle\sum_{k=2}^{\infty} \frac{1}{k^2}$

2. $\displaystyle\sum_{k=1}^{\infty} \frac{1}{k}$

Goals: Be able to :

1. determine whether a series $\sum a_k$ converges or diverges.
2. If it converges, find the limit (that is, the value of the series) exactly, if possible.
3. If it converges but we can't find the limit exactly, be able to approximate it.