Remember that quizzes are based on random problems from this worksheet. Please endeavor to work through these problems before the end of each discussion.

1. Let \( a_n = \frac{2n}{3n+1} \).
   a) Determine whether \( \{a_n\} \) is convergent.
   
   b) Determine whether \( \sum_{n=1}^{\infty} a_n \) is convergent.

2. Determine whether the geometric series is convergent or not. If it’s convergent, find it’s sum.
   a.) \( 3 - 4 \cdot \frac{16}{3} - \frac{64}{9} + \ldots \).
b.) \( \sum_{n=1}^{\infty} \frac{(-3)^{n-1}}{4^n} \)

c.) \( \sum_{n=1}^{\infty} \frac{2^{n-1} + 3^n}{5n+2} \)

d.) \( \sum_{n=1}^{\infty} \frac{e^n}{n^2} \)
e.) Determine whether the series is convergent or divergent by expressing $s_n$ as a telescoping sum. If it is convergent, find it's sum.
\[ \sum_{n=2}^{\infty} \frac{2}{n^2 - 1}. \]

part(e) will NOT be on the quiz so you can skip it for now.

Hint: First factor the denominator and express $\frac{2}{n^2 - 1}$ as a partial fraction.

f.) $\sum_{n=1}^{\infty} \ln\left(\frac{n}{n + 1}\right)$. 
3. Express the number as a ratio of integers.
   \[ 2.516 = 2.516516516... \]

4. Find the values of \( x \) for which the series converges. Find the sum of the series for those values of \( x \).
   (a) \[ \sum_{n=0}^{\infty} \frac{(x - 2)^n}{3^n} . \]
   (b) \[ \sum_{n=0}^{\infty} \frac{2^n}{x^n} . \]
5. If the $n^{th}$ partial sum of the series is $s_n = \frac{n - 1}{n + 1}$.

Find $\sum_{n=1}^{\infty} a_n$. 