Today's topics and news

- Topic: Definition of series
- **Homework:** Watch videos 13.5 - 13.7.

A telescopic series

I want to calculate the value of the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^2+2n}$.

1. Find a formula for the k-th partial sum $S_k = \displaystyle\sum_{n=1}^{k} \frac{1}{n^2+2n}$.

   Hint: $\displaystyle\frac{1}{n^2+n} = \frac{A}{n} + \frac{B}{n+2}$

2. Using the definition of series, compute the value of

$$\sum_{n=1}^{\infty} \frac{1}{n^2+2n}$$

What is wrong with this calculation? Fix it

Claim: $$\sum_{n=2}^{\infty} \ln \frac{n}{n+1} = \ln 2$$

"Proof"

$$\begin{aligned}
\sum_{n=2}^{\infty} \ln \frac{n}{n+1} &= \sum_{n=2}^{\infty} [\ln n - \ln(n+1)] \\
&= \sum_{n=2}^{\infty} \ln(n) - \sum_{n=2}^{\infty} \ln(n+1) \\
&= (\ln 2 + \ln 3 + \ln 4 + \ldots) - (\ln 3 + \ln 4 + \ldots) \\
&= \ln 2
\end{aligned}$$

Trig series: convergent or divergent?

1. $\sum_{n=0}^{\infty} \sin(n\pi)$
2. $\sum_{n=0}^{\infty} \cos(n\pi)$

Help me write the next assignment

In the next assignment I want to give you a series and ask you to calculate its value from the definition. I want the sequence of partial sums $\{S_n\}_{n=1}^{\infty}$ to be

$$\forall n \geq 1,\ S_n = n^2$$

What series should I ask you to calculate?