What we know so far

- $\sum a_k$ converges means that the sequence of partial sums $\{S_n\}$ converges

- **Geometric Series:** $\displaystyle\sum_{k=0}^{\infty} r^k$ converges to $\frac{1}{1-r}$ if $|r| < 1$ and diverges if $|r| \geq 1$
  Only applies to series in this special form!

- ***n*th Term Test:** If $\lim a_k \neq 0$ then $\sum a_k$ diverges
  Applies to any series

- **Direct Comparison Test:** Let $\{a_k\}$ and $\{b_k\}$ be sequences where $0 \leq a_k \leq b_k$ for all k
  - Then $0 \leq \sum a_k \leq \sum b_k$
  - If $\sum b_k$ converges, then so does $\sum a_k$
  - If $\sum a_k$ diverges, then so does $\sum b_k$

  Only applies to series with positive terms

Work on these for the rest of class time

For each series,

(a) What are the first three terms of the series?

(b) What are the first three partial sums of the series?

(c) Does the series converge or diverge?

(d) If a series converges, find the value to which it converges. If you cannot find the exact value, approximate it by computing S_{100}

1. $\displaystyle\sum_{k=0}^{\infty} \frac{-3}{5^k}$

2. $\displaystyle\sum_{k=1}^{\infty} \frac{3k^2+1}{2k^2+k+2}$

3. $\displaystyle\sum_{k=13}^{\infty} \frac{1}{2^k}$

4. $\displaystyle\sum_{k=2}^{\infty} \frac{5}{3^k+k}$

5. $\displaystyle\sum_{k=19}^{\infty} \frac{4^k}{2^k-19}$

6. $\displaystyle\sum_{k=7}^{\infty} \frac{2k^3-3}{7k^5+2k+5}$

For the series $\displaystyle\sum_{k=1}^{\infty} \frac{1}{n^2}$, the WolframAlpha syntax to calculate S_{30}, the 30th partial sum, is

```
sum 1/n^2 from n=1 to n=30
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