

Name: _____

Solve the following problems.

1. (a) Find

$$\lim_{n \rightarrow \infty} \frac{n^2 + n + 1}{3n^2 - n - 2}$$

- (b) Find an example of a sequence
- a_n
- which is bounded but not convergent.

2. If
- $x > 2$
- , use the geometric series formula to find
- $\sum_{n=0}^{\infty} \frac{2^{n+1}}{x^n}$
- .

3. Let
- $a_n = \frac{1}{n^2 - n}$
- and
- $S_N = \sum_{k=2}^N a_n$
- .

- (a) Use partial fractions to rewrite a_n .
- (b) Use part (a) to write out S_2 , S_3 and S_4 explicitly and notice how terms cancel. Generalize this to find a formula for S_N .
- (c) Compute $\sum_{k=2}^{\infty} a_n (= \lim_{N \rightarrow \infty} S_N)$.

4. Compute

$$\lim_{n \rightarrow \infty} \frac{n!}{n^n}.$$

5. Compute

$$\lim_{n \rightarrow \infty} \frac{n^3 + 7}{5n^3 + \ln n}.$$

6. Compute

$$\lim_{n \rightarrow \infty} \frac{8n^3 + 3\sqrt{n} - \ln n + 5^n}{n!}.$$