Reading Questions 5

1. The value of 4! is 20.
2. If n is a positive integer then $(n+1)! = n!(n+1)$.
3. The series $\sum_{n=1}^{\infty} \frac{1}{n!}$ diverges.
4. Which test was used in the example?

Section 9.4 Tests for Convergence (Part 3)

Ratio Test

Theorem: Ratio Test

Suppose $\lim_{n\to\infty} |\frac{a_{n+1}}{a_n}| = L$. then the series $\sum_{n=1}^{\infty} a_n$

1. converges if $L < 1$,
2. is undetermined if $L = 1$, and
3. diverges otherwise.

P 1. Up until this section, the sequence a_n of a series has not contained a factorial. Hence if the sequence contains a factorial that might be an indication to use the Ratio Test.

Determine if the series $\sum_{n=1}^{\infty} \frac{2}{(n+4)!}$ converges or diverges.

P 2. Can the Ratio Test be used to determine if the series $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{1}{n}$ converges or diverges?

P 3. Determine if the series $\sum_{n=1}^{\infty} \frac{6}{n+2^n}$ converges or diverges. Don't forget to first determine if $\lim_{n\to\infty} a_n = 0$.

Alternating Series

Theorem: Alternating Series Test

The series $\sum_{n=1}^{\infty} (-1)^{n-1} a_n$ converges if $0 < a_{n+1} < a_n$ and $\lim_{n\to\infty} a_n = 0$.

P 4. Determine if the series $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{n}{n^2+1}$ converges or diverges. Be sure to state any test that you use.

P 5. Can the alternating series test be used to determine if the series $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{n!}{n^3+2}$ converges or diverges? If so, state whether the series converges or diverges.

P 6. The alternating series test can be applied to $\sum_{n=1}^{\infty} (-1)^{n-1} a_n$ where $0 < a_{n+1} < a_n$ for all n and $\lim_{n\to\infty} a_n = 0$. Give an example of a sequence a_n where $0 < a_{n+1} < a_n$ for all n and $\lim_{n\to\infty} a_n \neq 0$.