

Student No: _____
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MATH 118 - 2018 Spring
Section-24 Quiz-3

Test the following series for convergence:

(a) $\sum_{n=1}^{\infty} \frac{118^n}{(n+117)!}$

(b) $\sum_{n=1}^{\infty} \frac{1}{2^n - 5}$

Note: Show all your work as is done in the lectures.

ANSWER

(a) Let $a_n = \frac{118^n}{(n+117)!}$

We have $\lim_{n \rightarrow \infty} \frac{a_{n+1}}{a_n} = \lim_{n \rightarrow \infty} \frac{118^{n+1}}{(n+118)!} \cdot \frac{(n+117)!}{118^n} = \lim_{n \rightarrow \infty} \frac{118}{n+118} = 0 < 1$

Thus, $\sum_{n=1}^{\infty} \frac{118^n}{(n+117)!}$ converges by Ratio Test

(b) Let $a_n = \frac{1}{2^n - 5}$ and $b_n = \frac{1}{2^n}$

We have $\lim_{n \rightarrow \infty} \frac{a_n}{b_n} = \lim_{n \rightarrow \infty} \frac{\frac{1}{2^n - 5}}{\frac{1}{2^n}} = \lim_{n \rightarrow \infty} \frac{2^n}{2^n - 5} = \lim_{n \rightarrow \infty} \frac{1}{1 - \frac{5}{2^n}} = 1$

Since $\sum_{n=1}^{\infty} b_n$ converges, so does $\sum_{n=1}^{\infty} a_n$ by part 1 of the
Limit Comparison Test.