

Math1152Q, Fall17 — Reading homework Sec 11.4 Limit comparison test

Due Week 3 Friday, Sept 15 (graded on completion) Name: _____

Exercise 1. Consider the series

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

1. (2 mins) Compute the value of $\frac{n+1}{n^3+2}$ for $n = 100$ and $n = 1000$. Explain why the terms $\frac{n+1}{n^3+2}$ and $\frac{n}{n^3}$ are essentially the same when n is large.

2. (2-8 mins) Let $a_n = \frac{n+1}{n^3+2}$ and $b_n = \frac{n}{n^3} = \frac{1}{n^2}$. Calculate

$$\lim_{n \rightarrow \infty} \frac{a_n}{b_n}.$$

What do you think the value of the limit tells you about the relationship between a_n and b_n for large values of n ?

3. (2 mins) Go to page 728 Sec 11.4. The series $\sum_{n=1}^{\infty} \frac{1}{n^2}$ is an example of a p-series (in this case, $p=2$). Does this series converge or diverge? (See the answer near the top of the page).

4. (2-5 mins) What do you think this tells us about the convergence or divergence of $\sum_{n=1}^{\infty} \frac{n+1}{n^3+2}$? You can write a guess or explain what you think.

Exercise 2. Go to page 729 Sec 11.4.

(2-5 mins) Write down below the statement of the limit comparison test (copy from the blue box on pg 729).

(5 mins) Read Example 3 for how to use the limit comparison test on the series $\sum_{n=1}^{\infty} \frac{1}{2^{n-1}}$

(5-10 mins) Apply the same technique to determine whether the following series converge or diverge:

1. $\sum_{n=1}^{\infty} \frac{1}{5^{n-4}}$

2. $\sum_{n=1}^{\infty} \frac{10^n}{3+9^n}$