

## Homework Assignment for Week 01

1. Section 8.8:

Verify the convergence of the improper integrals  $\int_0^1 x^{-p} dx$  and  $\int_1^\infty x^{-p} dx$  for  $p > 1$ ,  $p = 1$  and  $0 < p < 1$ , respectively by direct evaluation. Then memorize the results.

2. Section 8.8:

Problems: 7, 13, 19, 21, 25, 31, 35, 39, 42, 45, 46, 55, 65, 66, 77, 81, 83.

Note: For problem 66, just read it. All other problems, need not find the values of the integrals (unless you find it convenient). Just determine whether each of them converges or not.

You may find it convenient to use Theorem 2 and Theorem 3 for almost all of the problems. In most (but not all) problems, you can compare the integrand with one of the cases in Problem 1 above.

(a) Hint for problem 42: For what values of  $q$  does  $\lim_{t \rightarrow 0^+} \frac{t - \sin t}{t^q} = L$  satisfy  $0 < L < \infty$ ?

(b) Revision for problem 77: Skip part (a) and change part (b) to

”Explore the convergence of  $\int_0^1 \frac{\sin t}{t} dt$ .”

Hint: For what values of  $q$  does  $\lim_{t \rightarrow 0^+} \frac{\frac{\sin t}{t}}{t^q} = L$  satisfy  $0 < L < \infty$ ?

3. Section 8.8:

For what values of  $p > 0$  does  $\int_0^1 \cot^p x dx$  converge?

4. Chapter 8, Additional and Advanced Exercises:

Problem 8.

Hint: Use  $\frac{\infty}{\infty}$  version of L'Hôpital's Rule.

5. Section 10.1:

Problems 53, 59, 63, 67, 69, 73, 81, 87, 89.

Hint for problem 73: Read Appendix A.5.