

## Homework 01

1. Section 8.8:

Verify the convergence/divergence of the improper integrals  $\int_0^1 \frac{1}{x^p} dx$  and  $\int_1^\infty \frac{1}{x^p} dx$  for  $p > 1$ ,  $p = 1$  and  $0 < p < 1$ , respectively by direct evaluation (total 6 cases). Then memorize the results.

2. Section 8.8:

Problems: 7, 13, 25, 31.

3. Section 8.8: Problems: 35, 39, 41, 45, 55, 65, 66.

4. Section 8.8:

Let  $f(x) = \frac{1}{x^{0.5} \ln x}$ . Is the improper integral  $\int_e^\infty f(x) dx$  convergent?

Hint: Try not to find the anti-derivative of  $f(x)$ , but instead find a suitable  $g(x)$  for comparison using Theorem 2 or Theorem 3. See also Example 5-7 of Lecture 02 on how to find  $g(x)$ .

5. Section 8.8:

Do the same for  $\int_0^{\frac{1}{e}} \frac{1}{x^2 |\ln x|} dx$ .