Submit this homework through Gradescope. If you are not familiar with Gradescope, check the [website](#) for an instruction on how to use Gradescope.

Solve the following problems in the textbook. Please show your work.

2. Section 90-91 page 282, problem 2.
4. Evaluate $\int_{0}^{\infty} \frac{\ln x}{x^2+4} \, dx$.
5. Evaluate $\int_{0}^{\infty} \frac{1}{(x^2+1)(x+1)} \, dx$.

**Some tips:**

1. You are suggested to do these problems after the lecture of Monday, May 2nd.
2. Hint for Q5: Integrate the function $f(z) = \frac{\log z}{(z^2+1)(z+1)}$ over the keyhole contour (Figure 110 in Section 91).
3. Please show the process how you derive the final answer. When you evaluate an improper integral by using contour integrals, please make sure
   - sketch the simple closed contour you use;
   - when you compute the residue, show the process of how you found the residue;
   - if you claim an integral over some contour is going to zero, show the estimates and justify the claim.

**Academic Integrity for the homework:** For the homework, you are allowed to discuss the homework problems with your classmates, Shubham and also me. But you need to write your solution down all by yourself. Simply copying the solution from other sources will be regarded as academic violation.

**Note:** Depending on the assigned workload for our grader, possibly only a subset of the questions will graded. But you are supposed to finish all the above problems.