Here’s the plan: Homework 9 is due Wed 4/11, Homework 10 will be due Mon 4/16, Homework 11 will be due Mon 4/23. Third exam, in class, Fri. 4/27 (or Wed. night 4/25, if everybody agrees.) Final is (no choice) Sat. 5/5 1:30 – 4:30.

1. §2.5 – 27 aceh (Yes, the answers are in the back, so you have to explain them, too!)
2. §2.5 – 22 e.
3. §2.6 – 6.
4. §2.6 – 12
5 and 6. (E) Compute, with an explicit discussion of the behavior on the semicircle,

\[ \int_0^\infty \frac{x^2}{(x^2 + 9)^3} \, dx. \]

Note the limits of integration and the fact that the integrand is even.

7. (E) Observe that \( z^4 + 4 = (z^2 - 2z + 2)(z^2 + 2z + 2) \), and use this fact to evaluate

\[ \int_{-\infty}^{\infty} \frac{x^2}{x^4 + 4} \, dx. \]

8. Let \( f(z) = \frac{1}{z} + \frac{1}{z^2 - 1} \). Find, carefully, Laurent series for \( f \) which converge in each of the following regions: (a) \( |z - 2| < 1 \), (b) \( 1 < |z - 2| < 2 \), (c) \( 2 < |z - 2| \).

9. (E) Classify the singularities (in the complex plane plus infinity) and including the order of the poles if relevant, of the following functions

\[ f_1(z) = \frac{(z + 2)^2}{z^3(z - 1)}, \quad f_2(z) = \frac{(e^z - 1)^2}{z^4}. \]

10. (E) Let \( f(z) = \frac{e^{iz}}{z^2 + 1} \).

a. Find a constant \( M_1 \) so that \( |f(z)| \leq M_1 \) for \( z \) on the real interval \([-10, 10]\).

b. Find a constant \( M_2 \) so that \( |f(z)| \leq M_2 \) for \( z \) on the upper semicircle \( z = 10e^{it}, 0 \leq t \leq \pi \).

c. Find a constant \( M_3 \) so that \( |f(z)| \leq M_3 \) for \( z \) on the lower semicircle \( z = 10e^{it}, \pi \leq t \leq 2\pi \).