Math 348 **Homework 8** **Due Friday, Mar. 31, 2000**

1. ($\mathcal{E}$) Express

$$f(z) = \frac{z-2}{z}$$

as a Laurent series in z and as a Taylor series in $z-1$ and discuss convergence.

2. §3.6 – 4.

3. §3.8 – 4.

4. §3.8 – 9. (Hint: write it as a sum of two functions in the obvious way.)

5. ($\mathcal{E}$) Classify the singularity of

$$f(z) = \frac{\sin(z^2) - z^2}{z^{11}}$$

at $z = 0$ as one of (removable singularity, essential singularity, pole of order m for specific m) and compute the residue of f at $z = 0$.

6. Find complex numbers a, b, c and d so that

$$\frac{1}{\frac{1}{1+z} - a\cos(bz) - c\sin(dz)}$$

has a pole of order 4 at $z = 0$. Yes, this is mindless calculation.

7. p. 175, 8.6.

8. ($\mathcal{E}$) Compute

$$\int_C \frac{1}{z^2(z-2)}\, dz$$

for each of the four contours sketched below. Be alert to orientation!

9. ($\mathcal{E}$) Let C be any simple closed contour, described in the positive orientation of the complex plane. For complex numbers z which are not on the contour C, define

$$g(z) = \int_C \frac{e^{4\zeta}}{(z-\zeta)^4}\, d\zeta.$$

Compute $g(z)$ when z is inside C and compute $g(z)$ when z is outside C.

10. §4.2 – 1.

11. §4.2 – 2 (first three).

12. §4.2 – 3 (first two).