CAAM 335: Matrix Analysis
HW 7, 2009

Problem 1 (5+5+5=15 points) (a) Compute the integral $\int_C f(z)dz$ for

$$f(z) = \bar{z} \quad C = \{ t^2 + it : t \in [0,2] \}.$$ 

(b)-(c) Verify Cauchy’s theorem for the functions

$$f(z) = 3z^2 + iz - 4,$$
$$f(z) = 5 \sin(2z),$$

if $C$ is the square with vertices $1 \pm i$, $-1 \pm i$.

Problem 2 (5+5+10 =20 points) Find the residues of the following functions at 0:

$$(2z + 1)/z, \quad e^z/z^2, \quad (2z + 1)/(z(z^3 - 5)).$$

Problem 3 (5+10=15 points) Let $C = \{ 3e^{it} : t \in [0,2\pi) \}$. Compute (with necessary steps) the two integrals

$$\int_C e^{2z}/(z+1)^4dz, \quad \int_C \frac{\sin(\pi z^2) + \cos(\pi z^2)}{(z-1)(z-2)}dz.$$ 

(You may use results from Chapter 8 to arrive quickly at the solutions.)

Lecture Notes Section 8.5 (P. 93)

— Exercises [1] 20 points.
(It is allowed to use Matlab symbolic toolbox to find the resolvent, but show the commands used).
— Exercises [2] 10 points
— Exercises [3] 20 points