Math 410 **Dr. DeTurck**
Assignment 3 **Due Tuesday, October 6, 2009**

Reading: Textbook, rest of Chapter 1, first two sections of Chapter 2

Practice problems: (don't hand these in)

1. Compute
$$\int_\gamma x\,dz$$
where γ is the directed line segment from 0 to $1+i$.

2. Compute
$$\int_{|z|=r} x\,dz,$$
where the circle is traversed in the positive direction (i.e., counterclockwise), in two ways. First, use a parametrization and second by observing that $x = \frac{1}{2}(z+\overline{z}) = \frac{1}{2}\left(z + \frac{r^2}{z}\right)$ on the circle.

3. Compute
$$\int_{|z|=2} \frac{dz}{z^2-1}$$
where the circle is traversed in the positive direction.

4. Textbook page 30, problem 25(b)

Problems to hand in:

1. Suppose that $f(z)$ is analytic and that $f'(z)$ is continuous in a region that contains the closed curve γ. Show that
$$\int_\gamma \overline{f(z)} f'(z)\,dz$$
is purely imaginary.

2. Assume that $f(z)$ is analytic and satisfies the inequality $|f(z)-1| < 1$ in a region Ω. Show that
$$\int_\gamma \frac{f'(z)}{f(z)}\,dz = 0$$
for every closed curve γ in Ω.

3. If $P(z)$ is a polynomial and C denotes the circle $|z-a| = R$, what is the value of
$$\int_C P(z)\,d\overline{z}\ ?$$

4. Textbook page 30, problem 25 (a),(c)