

Math 185-5 Fall 2015, Homework 9

Do not turn in, solutions will be posted on October 28

1. 77.2, 81.1ac, 81.2bc, 81.4, 81.6, 83.5, 94.1, 94.5, 94.6ab, 94.7a, 94.8.
2. Let $f(z)$ be analytic on and inside the circle C given by $|z| = \rho$ and suppose $f(z) \neq w_0$ for points z on C . Explain why the integral

$$\frac{1}{2\pi i} \oint_C \frac{f'(z)}{f(z) - w_0} dz$$

counts the number of solutions of $f(z) = w_0$ inside C .

3. Suppose $f(z)$ is analytic on and inside a simple closed contour C . Prove that if $f(z)$ is one-to-one on C then it is one-to-one in the interior of C . (hint: consider the image contour $f(C)$).
4. Give an example showing that Rouché's theorem is false if we weaken the hypothesis to $|g(z)| \leq |f(z)|$ on C (instead of $|g(z)| < |f(z)|$.)