

**MATH 421 COMPLEX ANALYSIS,
FALL TERM 2004 PROBLEMS 11**

Return by Monday 15th November

1. Do questions 10.3 and 10.5 on page 127.
2. Let \mathcal{C} be a path leading from z_1 to z_2 . Suppose that f is differentiable on a region \mathcal{D} and \mathcal{C} is contained in \mathcal{D} , and that $f'(z)$ is continuous on \mathcal{C} . Let \log denote that branch of the logarithm with $-\pi < \Im \log \leq \pi$. If necessary, review the last paragraph of §7.16 of the book.
 - (i) If $f(z)$ is not 0 or negative on \mathcal{C} , then prove that

$$\int_{\mathcal{C}} \frac{f'(z)}{f(z)} dz = \log f(z_2) - \log f(z_1).$$

- (ii) If $f(z)$ is not 0 or positive on \mathcal{C} , then prove that

$$\int_{\mathcal{C}} \frac{f'(z)}{f(z)} dz = \log (-f(z_2)) - \log (-f(z_1)).$$