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Homework 11  
Due: Friday, November 10

1. Suppose that  $f(z) = u(x, y) + iv(x, y)$  is continuous on a closed, bounded region  $R$ , and that it is analytic and nonconstant in the interior of  $R$ . Prove that  $u(x, y)$  achieves its maximum value on the boundary of  $R$ , and not in the interior of  $R$ . (HINT: Consider  $\exp(f(z))$ .)
2. Prove the following assertion from class:  
THEOREM A sequence  $\{z_n\}_{n=1}^{\infty}$  is Cauchy if and only if it has a limit.  
(HINT: You can use anything we did in class, especially November 3.)
3. [BC] 52.3, 52.6.
4. [BC] 54.2.
5. [BC] 24.7. *This should have been assigned a month ago; we used it in the lemma leading up to the maximum modulus principle.*