Math 300: Assignment #5:  
Due: Friday, Oct. 23. in class.


2. Section 3.3: 16.

3. Recall that $\arg_{\tau}(z)$ is the branch of the argument that lies in $(\tau, \tau + 2\pi]$.
   Let $L_{\tau}$ be the branch of the logarithm defined using $\arg_{\tau}(z)$.
   a. Find $L_0(-i), L_{\pi/2}(i)$.
   b. Where is $L_{\pi/2}(z^2 + 1)$ analytic?

4. Find the principal values of
   a. $(-i)^{i-1}$.
   b. $i^{2/3}$.

5. Let the square root be computed using the branch $L_{\pi/2}$ of the logarithm.
   a. Where is $(z^2 - i)^{1/2}$ analytic?
   b. Where is $z(1 - i/z^2)^{1/2}$ analytic? (Hint: show that if $z$ is in the non-
      analytic locus then $z^2$ lies on the half-circle with center $i/2$ and radius
      1/2. Sketch the set of such $z$.)

6. Where is the principal branch of $\tan^{-1}(z)$ analytic?

7. Consider the principal branch of $\sin^{-1}(z)$. (That means, both the logarithm
   and the square root are computed using the principal branches.)
   a. Show that if $z$ is purely imaginary, $z = ib$, then so is $\sin^{-1}(z)$?
   b. If $z$ is real, is $\sin^{-1}(z)$ also real?