1. Ahlfors section 1.2.1 exercise 2, p. 15.

2. Ahlfors section 1.2.4 exercise 5, p. 20. Your answer should depend only on $R$ and $|a|$. It may help to first read Ahlfors pp. 19–20.

3. Ahlfors section 2.1.2 exercise 3, p. 28. (Just use integration, not the “formal method”.)

4. (a) Ahlfors section 2.2.4 exercise 3, p. 41.
(b) Ahlfors section 2.2.4 exercise 7, p. 41.

5. Suppose $U, V \subset \mathbb{C}$ are open and we have maps $f : U \rightarrow V$ and $g : V \rightarrow \mathbb{C}$ such that $g(f(z)) = z$ for all $z \in U$. Suppose further that $f$ is continuous, $g$ is analytic, and $g'(z) \neq 0$ for all $z \in V$. Prove that $f$ is analytic.
(In particular, this implies that any branch of the logarithm is analytic.)

6. (a) Show that one can define a branch of $\sqrt{z(z+1)}$ on $\mathbb{C} \setminus ((-\infty, -1] \cup [0, \infty))$; that is, there is an analytic function $f$ on this domain such that $f(z)^2 = z(z+1)$. Here $(-\infty, -1]$ and $[0, \infty)$ represent intervals in the real line.
(b) Show that one can define a branch of $\sqrt{z(z+1)}$ on $\mathbb{C} \setminus [-1, 0]$. 

Ground rules for homework in this course: you may work with your classmates on the homework, but you must write up your solutions by yourself, and you should name anyone that you worked with. Also please remember that in general, late homeworks will not be accepted.

As a reminder, we will not have classes during the week of January 19 (that is, on January 21 or January 23), and so you have more time than usual to finish this problem set.