M361 Assignment 3

Due in class Thursday, September 18.

1. (a) Show that $\operatorname{Log} z$ is purely imaginary (i.e. $\operatorname{Re} \operatorname{Log} z = 0$) if and only if $|z| = 1$.
   (b) Show that $\operatorname{Log} z$ is real if and only if z is real and positive.
2. For $a, b \in \mathbb{C}$, show that a^b is single-valued if and only if $b \in \mathbb{Z}$.
3. Write $f(z) = z^2 + 2z$ in the form $f(x + iy) = u(x, y) + iv(x, y)$.
4. Let $f(z) = e^z$.
   (a) What is the image of the x-axis under f?
   (b) What is the image of the y-axis under f?
   (c) If $m \neq 0$, qualitatively what is the image of the line $y = mx$ under f?

Exercises from the textbook:
p. #33 1(a),(b),(c),(d),(e),(f).
p. #37: 1(b),(d).