Section 7.2 (p. 382) 11, 13

1. Find the image of the triangle with vertices at 1, i and 1 + i under the map \( f(z) = z^2 \).

2. Let \( D \) be the first quadrant \( \{ x + iy : x > 0, y > 0 \} \) with the unit (quarter) circle removed. The boundary of \( D \) is \( C_1 \cup C_2 \cup C_3 \) where \( C_1 = \{ iy : 1 \leq y < \infty \} \), \( C_2 = \{ e^{i\theta} : 0 \leq \theta \leq \pi/2 \} \) and \( C_3 = \{ x : 1 \leq x < \infty \} \). Solve \( \Delta \varphi = 0 \) in \( D \) with \( \varphi = 0 \) on \( C_1 \), \( \varphi = 1 \) on \( C_2 \) and \( \varphi = 0 \) on \( C_3 \). (Hint: use the Joukowski map \( f(z) = (1/2)(z + 1/z) \) composed with another map.)