1. (10 pts.) For each of the following maps, give an algebraic description (in terms of $x$ and $y$) of the image of $\{z: \text{Re}(z) = 1\}$.

(a) $f(z) = z^2$

(b) $f(z) = 2iz + 2 - i$

\[ a) \quad z = 1 + it, \quad t \in \mathbb{R} \]

$f(z) = (1 + it)^2 = 1 - t^2 + 2it$

\[ x = 1 - t^2 \]

\[ y = 2t \Rightarrow t = \frac{y}{2} \Rightarrow \quad x = 1 - \left(\frac{y}{2}\right)^2 \]

\[ b) \quad f(z) = 2i(1 + it) + 2 - i \]

\[ = 2i - 2t + 2 - i \]

\[ = -2t + 2 + i \]

\[ x-y \text{ formula is} \quad y = 1 \]

Note: Can also deduce this by "stretch by 2", "rotate 90° c.c.w.", "shift over 2 and down 1"