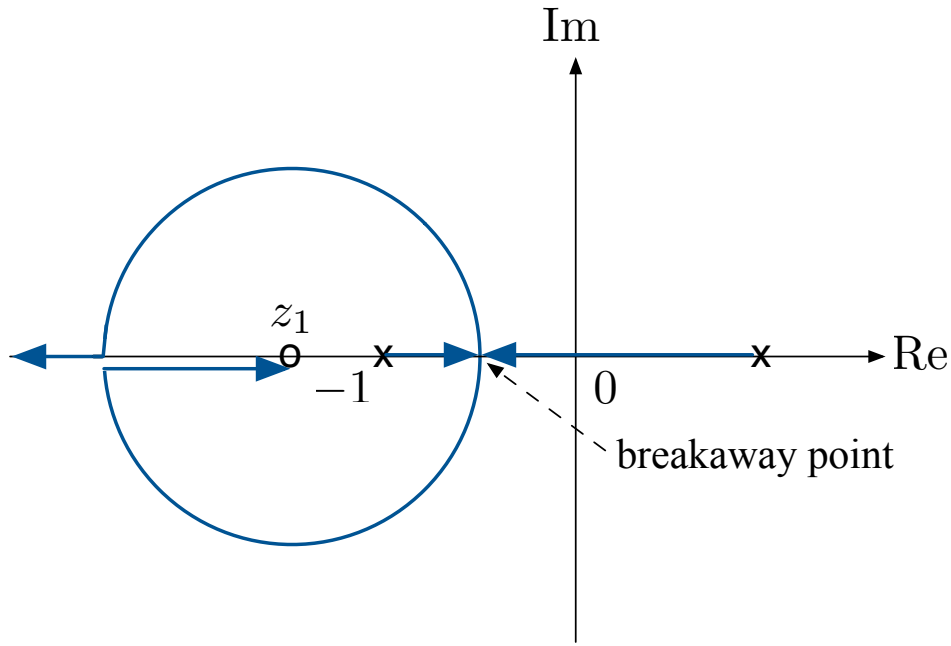
$$L(s) = \frac{s - z_1}{s^2 - 1}$$



Why does one of the branches go off to $-\infty$?

$s^2 - 1 + K(s - z_1) = 0$

$s^2 + Ks - (Kz_1 + 1) = 0$

$s = -\frac{K}{2} \pm \sqrt{\frac{K^2}{4} + Kz_1 + 1}, \; z_1 < 0$ as $K \to \infty$, s will be < 0