General Observations on Nyquist Plots

1). When s is on the big circle, $r \to \infty$, $G(s) = 0$. Therefore, the relavent information is contained in $G(jw)$.

This is called the frequency response.

2). Consider $L(s) = \frac{b_m s^m + \cdots + b_0}{a_n s^n + \cdots + a_0}$ $(n > m)$. When $w = 0$, $L(jw) = \frac{b_0}{a_0}$

3). When $w \to \infty$, $|L(jw)| \to 0$. $L(jw) \simeq \frac{b_m (jw)^m}{a_n (jw)^n} = \frac{b_m}{a_n} \cdot \frac{1}{(jw)^{n-m}}$ $\quad$ $Arg(L(jw)) = Arg(\frac{b_m}{a_n}) - (\frac{\pi}{2})^{n-m}$

4). Since $L(-jw) = L(\overline{jw}) = \overline{L(jw)}$ $\Rightarrow$ when traced the Nyquist plot for $w > 0$, can obtain Nyquist plot for $w < 0$ by flipping the obtained plot.

5). To get the intersections with the real and imaginary axis.

$Arg(jw) = \begin{cases} 0 \\ \pi \end{cases}$ $\Rightarrow$ intersections with real axis

$Arg(jw) = \begin{cases} \frac{\pi}{2} \\ -\frac{\pi}{2} \end{cases}$ $\Rightarrow$ intersections with imaginary axis

Alternatively, can set to zero the real part and imaginary part of $L(jw)$

Generalization of The Nyquist Theorem