The bilateral or two-sided Z-transform of a discrete-time signal $x[n]$ is the function $X(z)$ defined as

$$X(z) = Z\{x[n]\} = \sum_{n=-\infty}^{\infty} x[n]z^{-n}$$

Let $x[n] = 0.5^n u[n]$. Expanding on the interval $(-\infty, \infty)$, it becomes

$$x[n] = \{\ldots, 0.5^{-3}, 0.5^{-2}, 0.5^{-1}, 1, 0.5^1, 0.5^2, 0.5^3, \ldots\}$$

Looking at the sum

$$\sum_{n=-\infty}^{\infty} x[n]z^{-n} = \sum_{n=0}^{\infty} (0.5)^n = \frac{1}{1-0.5z^{-1}}$$

Using Matlab function `zplane` to generate the pole-zero diagram

First, follow the same procedure as lab 11 (Laplace transform) to generate the pole-zero diagram, and then plot the magnitude and phase of the system using `freqz` function for the following system functions:

1. $H(z) = \frac{z + 1}{z^2 - 0.9z + 0.81}$

2. $H(z) = \frac{2z^2 + 5z + 12}{z^2 + 2z + 10}$
3. \[ H(z) = \frac{2z^2 + 5z + 12}{(z^3 + 2z + 10)(z + 2)} \]

4. \[ H(z) = \frac{z^2 + 0.49z + 0.7}{(z + 0.4)(z + 0.33)(z - 0.75)} \]

Note: for your lab report, you only have to provide your Matlab code and figures generated for those four system functions (4 pole-zero diagrams and 4 frequency responses).