$$\text{"S"} \xrightarrow{e^{TS}} \text{"z"} \xrightarrow{\frac{2}{T}\left[\frac{z-1}{z+1}\right]} \text{"W"}$$

- $S = 0 \Rightarrow z = e^{T.0} = e^{0} = \boxed{1} \rightarrow W = \frac{2}{T}\left[\frac{1-1}{1+T}\right] = \boxed{0}$

- $S \rightarrow -\infty \Rightarrow z \rightarrow e^{-\infty T} = \frac{1}{e^{\infty T}} = \boxed{0} \rightarrow W = \frac{2}{T}\left[\frac{0-1}{0+1}\right] = \boxed{-\frac{2}{T}}$

- $S \rightarrow +j\frac{\omega_s}{2} \Rightarrow z = e^{T.j\frac{\omega_s}{2}} = e^{T.j\frac{\pi}{T}} = e^{j\pi} = \boxed{-1}$ *

  $\omega_s = \frac{2\pi}{T}$

  $\rightarrow W = \frac{2}{T} j \tan\left[\frac{\cancel{T}}{\cancel{2}} \cdot \frac{\pi}{\cancel{T}} \frac{\cancel{2}}{2}\right] = \frac{2}{T} j \tan\left(\frac{\pi}{2}\right) = \boxed{+j\infty}$

- $S \rightarrow -j\frac{\omega_s}{2} \Rightarrow z = e^{-Tj\frac{\omega_s}{2}} = e^{-j\pi} = \boxed{-1}$ *

  $\omega_s = \frac{2\pi}{T}$

  $\rightarrow W = \frac{2}{T} j \tan\left[-\frac{\cancel{T}}{\cancel{2}} \frac{\pi}{\cancel{T}} \frac{\cancel{2}}{2}\right] = \frac{2}{T} j \tan\left(\frac{-\pi}{2}\right) = \boxed{-j\infty}$

Omega

* We will Show in Lecture 11 that $W = \frac{2}{T}\left[\frac{z-1}{z+1}\right] = \frac{2}{T} j \tan\left[\frac{\omega T}{2}\right]$