will approach finite value
use matlab to show whether or not goes to infinity

Compare 5.4 & 5.10
SOLVE

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25 $\frac{\Theta_m(s)}{V_m(s)} = \frac{K/T}{s^2 + \frac{1}{T}s + K/T}$ (5.10)

$\frac{Y(s)}{R(s)} = \frac{K\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$ (5.4)

ζ zeta

$\frac{\Theta_m(s)}{V_m(s)} = \frac{Y(s)}{R(s)} \rightarrow \frac{K/T}{s^2 + \frac{1}{T}s + K/T} = \frac{K\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$

$\omega_n^2 = K/T = Y_{km} \Big/ \frac{J_{eq}R_m}{K_m^2} = \frac{1}{k_m} \cdot \frac{k_m^2}{J_{eq}R_m} = \frac{k_m}{J_{eq}R_m}$

$K = 1/k_m$

$T = \frac{J_{eq}R_m}{K_m^2}$

$\omega_n^2 = \frac{k_m}{J_{eq}R_m} \rightarrow \boxed{\omega_n = \sqrt{\frac{k_m}{J_{eq}R_m}}}$

26 $2\zeta\omega_n \$ = 1/T \$$

$\zeta = \frac{1}{2T\omega_n} = \frac{1}{2\left(\frac{J_{eq}R_m}{K_m^2}\right)\sqrt{\frac{k_m}{J_{eq}R_m}}} = \frac{1}{2\left(\frac{J_{eq}R_m}{K_m^2}\right)\frac{k_m^{1/2}}{J_{eq}^{1/2}R_m^{1/2}}}$

$= \frac{1}{2\left(\frac{(J_{eq}R_m)^{1/2}}{(k_m^{3/2})}\right)} = \frac{1}{1} \cdot \frac{k_m^{3/2}}{\sqrt{J_{eq}R_m}}$

$\boxed{\frac{k_m^{3/2}}{2\sqrt{J_{eq}R_m}} = \zeta}$

Q7 $\frac{K}{T} = K w_n^2$ → $\frac{\frac{1}{km}}{\frac{Jeq\,Rm}{km^2}} = \frac{1}{km}\left(\frac{km}{Jeq\,Rm}\right)$

$\frac{1}{km}\,\frac{km^2}{Jeq\,Rm} = \frac{1}{Jeq\,Rm}$

$\frac{km}{Jeq\,Rm} = \frac{1}{Jeq\,Rm}$

$K = 1/km$

$T = \frac{Jeq\,Rm}{km^2}$

$km = 1$

$K = 1/km = 1/1 = 1$