a. "phase" cross-over: (intersection with real axis)

$$(2-\omega^2)=0 \rightarrow \omega=\pm\sqrt{2}$$

$$\omega_c=\sqrt{2}$$

$$GH(\omega_c)=\frac{-3K}{4+10+4}=-\frac{3}{18}K=-\frac{K}{6}$$

$$GH(\omega_c)>-1 \rightarrow -\frac{K}{6}>-1 \rightarrow K<6 \qquad K_{cr}=6$$

b. asymptotes

$$\lim_{\omega\to 0^+} GH(j\omega)=-\frac{3K}{4}-\infty j$$

Closed loop:

$$\frac{\frac{K}{s^3+3s^2+2s}}{1+\frac{K}{s^3+3s^2+2s}}=\frac{K}{s^3+3s^2+2s+K}$$

	$s^3 + 3s^2 + 2s + K$	
s^3	1	2
s^2	3	K
s^1	$\frac{6-K}{3}$	0
s^0	K	0

$6-K>0 \rightarrow K<6$

$K>0$

$\boxed{0<K<6}$

$K>0$

$K<6$