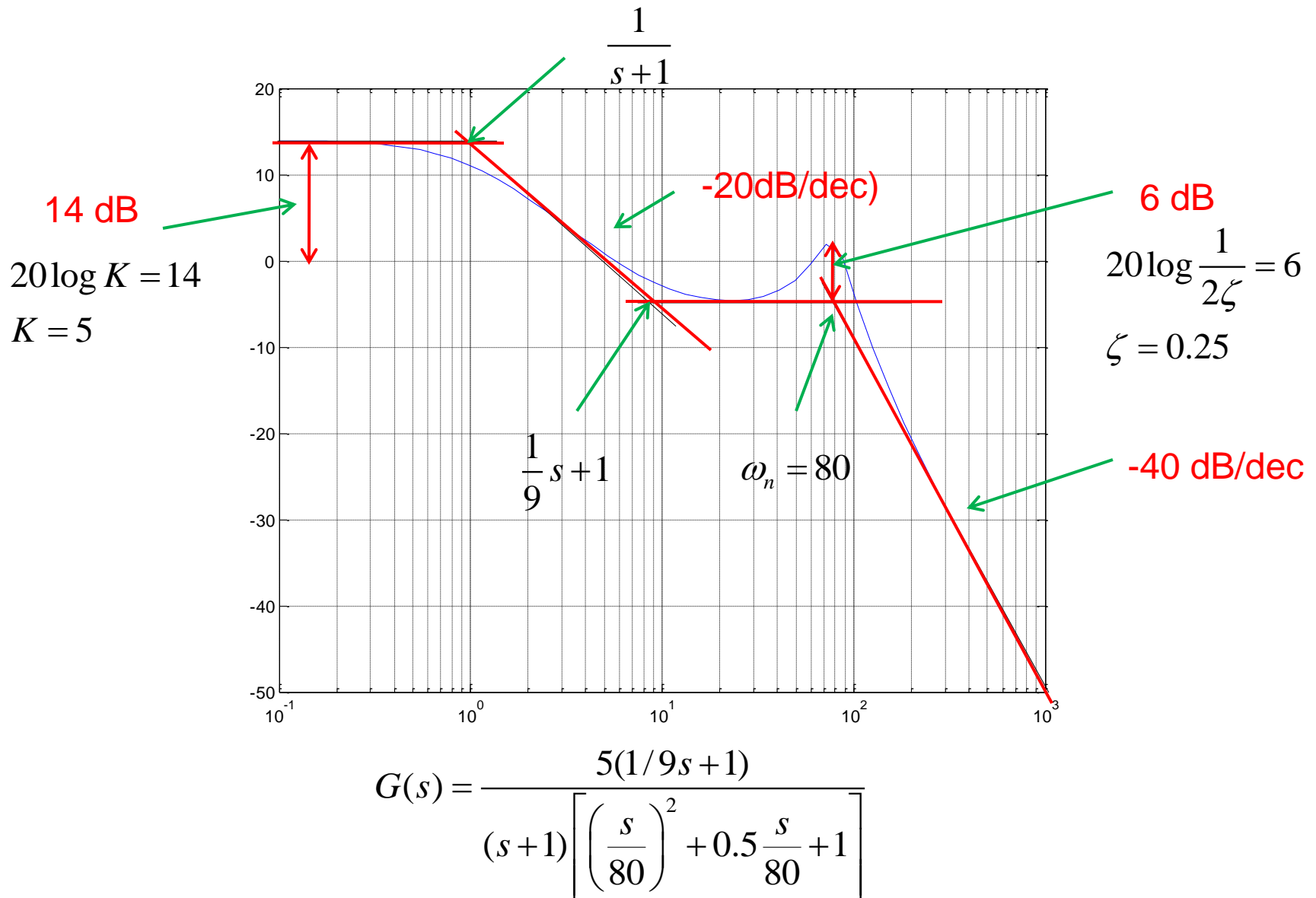
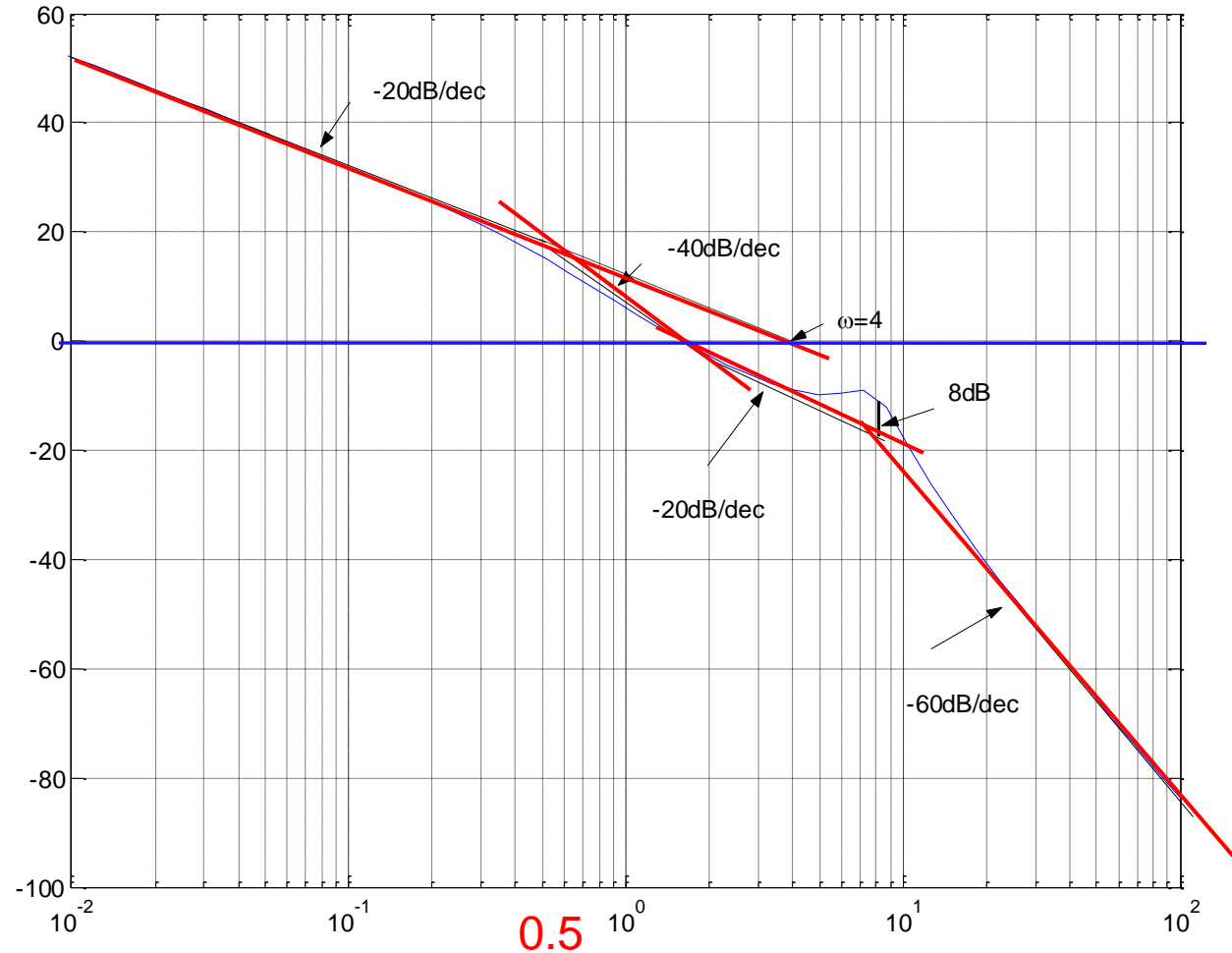


Tut # 9 Solutions

9.1 Approximate the magnitude by asymptotes:



9.2 Approximate the magnitude plot by asymptotes (noting that there is a 1st order pole at 0.5 rad/s)



- At low frequency, the asymptote is -20dB/dec, implying $N = 1$.
- At $\omega = 2$, the gradient of asymptote changes from -40dB/dec to -20dB/dec, implying that there is a zero, i.e. $a=2$.
- At $\omega = 8$, there is a resonance and the magnitude at 8 rad/s is approximately 8 dB. Hence

$$\omega_n = 8 \text{ rad/s} \quad 20 \lg \frac{1}{2\zeta} = 8 \Rightarrow \zeta = 0.2$$

- The extended low frequency asymptote crosses 0 dB at about 4 rad/s. This implies that the normalized gain is 4. That is,

$$K_{nor} = \frac{Ka}{0.5\omega_n^2} = \frac{K2}{0.5 \times 8^2} = 4 \Rightarrow K = 64$$