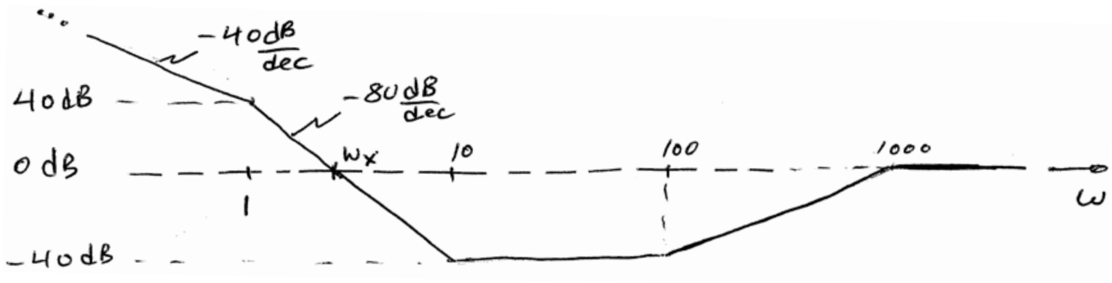
HW 7: STRAIGHT-LINE BODE DIAGRAMS (MAGNITUDE AND PHASE)

(1) B-7-1 (c)

(2)

(a) Given the straight line Bode diagram of magnitude below, find a corresponding transfer function.



Note: The line on the range of frequencies from 10 and 100 is horizontal at a level of -40 dB.

(b) Giving mathematical justification, determine the numerical value of ω_x.

For the transfer functions below, sketch the straight-line Bode diagrams of magnitude and phase. Note: The first step is to place the transfer function in normalized (time constant) form. Transfer function (6) is already in normalized form.

(3) $H(s) = \frac{s-2}{s^2}$

(4) $H(s) = \frac{2(s+20)}{s^2(s+2)}$

(5) $H(s) = -\frac{10}{s} \cdot \frac{s+10}{s+100}$

(6) $H(s) = \frac{1+s/1}{1-s/0.5}$

(7) $H(s) = \frac{1}{s^2+0.6s+1}$

In addition to drawing the straight line Bode diagrams of magnitude and phase for problem 7, determine the damping ratio and use it together with Figure 7-9 to visually approximate the maximum error in magnitude (in dB) that is introduced by the straight-line Bode diagram. Repeat for phase.