

HW #5: SOLUTIONS

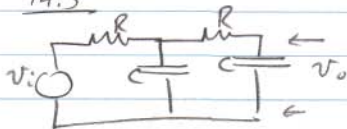
1) QUESTION 14.1

The zero is at -1

QUESTION 14.2

Slope above cutoff is -40 dB/dec .

2. 14.3



QUICK:
$$\frac{v_o}{v_i} = \left(\frac{1/sC}{R + 1/sC} \right)^2 = \frac{1}{(sRC + 1)^2}$$

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

Double pole @ $\omega = \frac{1}{RC} = 12.5 \text{ s}^{-1}$

No zeros

$$3. \quad 14.9 \quad H(\omega) = \frac{10}{(1+j\omega)(10+j\omega)} = \frac{1}{(1+j\omega)(1+j\frac{\omega}{10})}$$

poles @ $\pm j, 10$

$$DC: 20 \log K = 0$$

See GRAPH PAPER.

4. 14-15

$$H(s) = \frac{40(s+1)}{(s+2)(s+10)} = \frac{40(s+1)}{(\frac{s}{2}+1)(\frac{s}{10}+1)} 20 = \frac{2(s+1)}{(\frac{s}{2}+1)(\frac{s}{10}+1)}$$

Zero @ -1

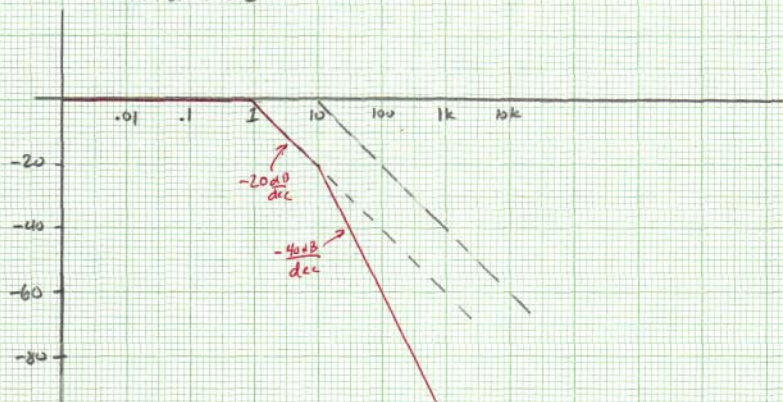
$$20 \log 2 = 6.02$$

Pole @ $-2, -10$

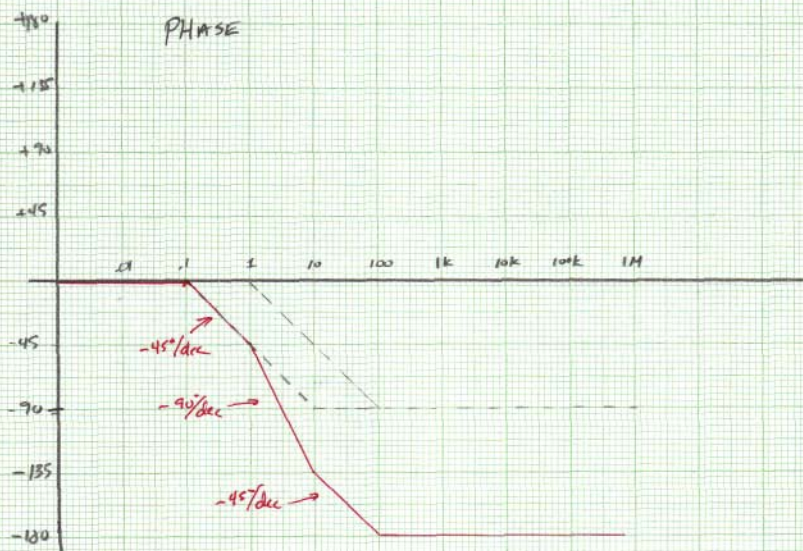
See Graph Paper

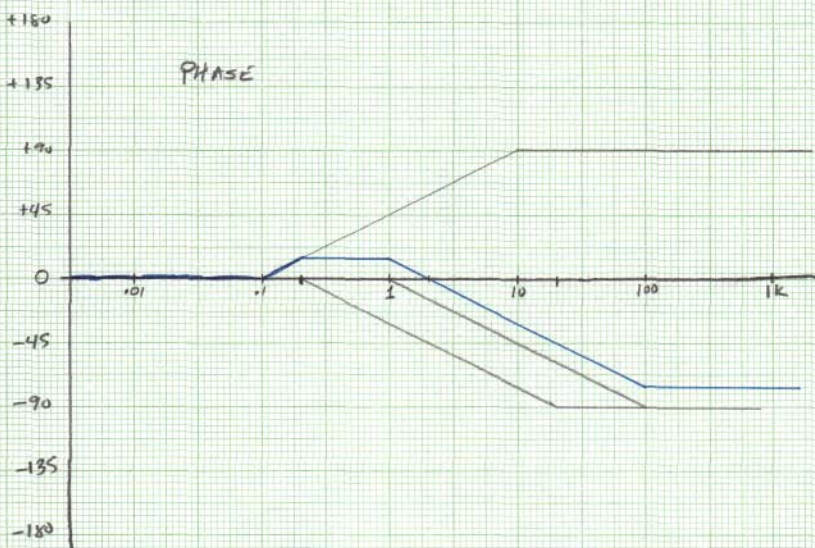
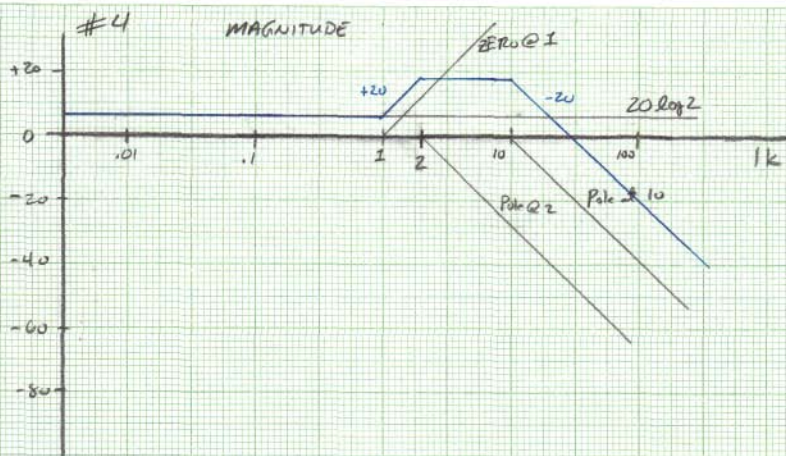
#3

MAGNITUDE



PHASE





5. 14.22

Zero @ 2

Poles @ 20, 100

DC = +20 dB

$$20 \log K = 20$$

$$\log K = 1$$

$$K = 10$$

$$\therefore H(s) = \frac{10 \left(1 + \frac{s}{2}\right)}{\left(1 + \frac{s}{20}\right) \left(1 + \frac{s}{100}\right)}$$