Jason Shelver

$\omega_o = 1$

$H(j1) = \frac{-j20}{1} \Rightarrow 20\log(H(j1)) = 26\ [dB]$

$\phi = -90^\circ$

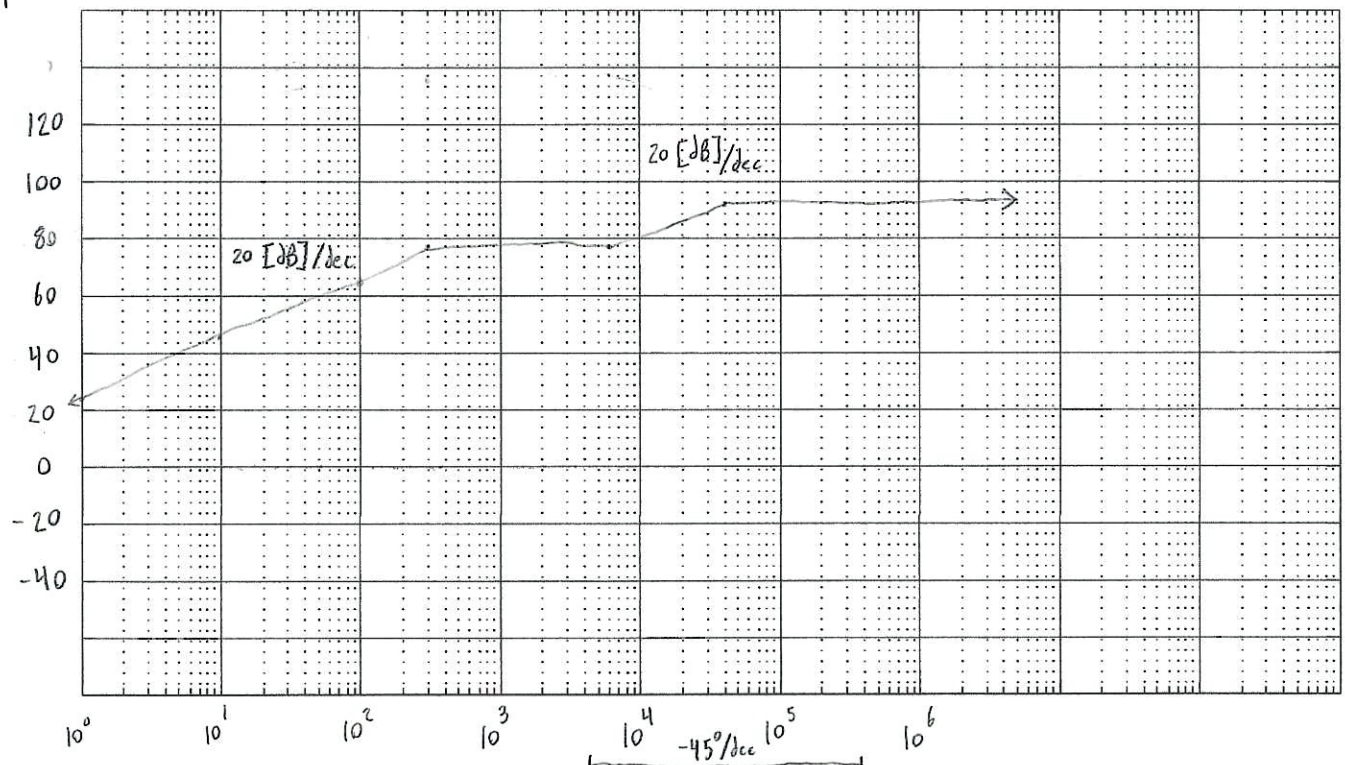
$Z_1 = 6000$

$P_1 = 300$

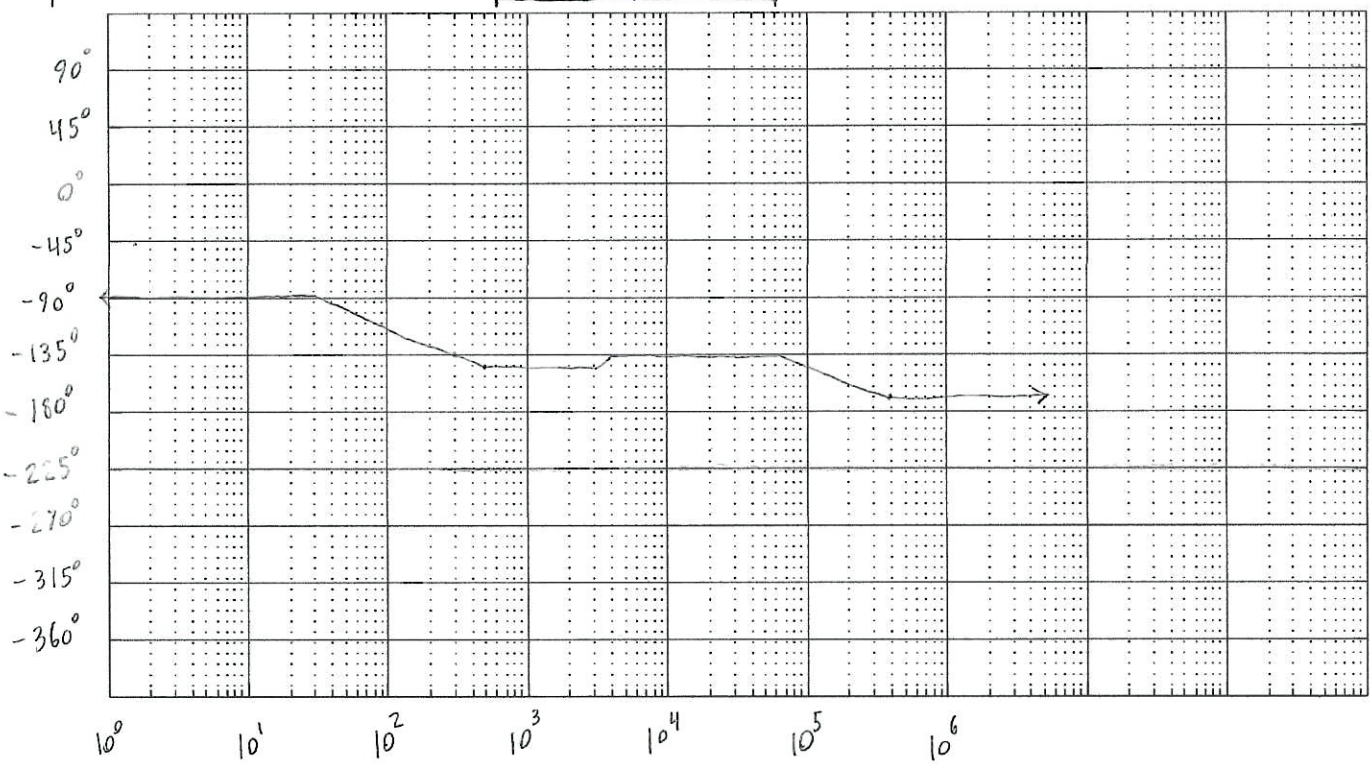
$P_2 = 40000$

1.)

$|H(j\omega)|$ [dB]



ϕ [deg]



2.)

$w_o = 30$

$H(j30) = -30 \Rightarrow 29.5\ [dB]$

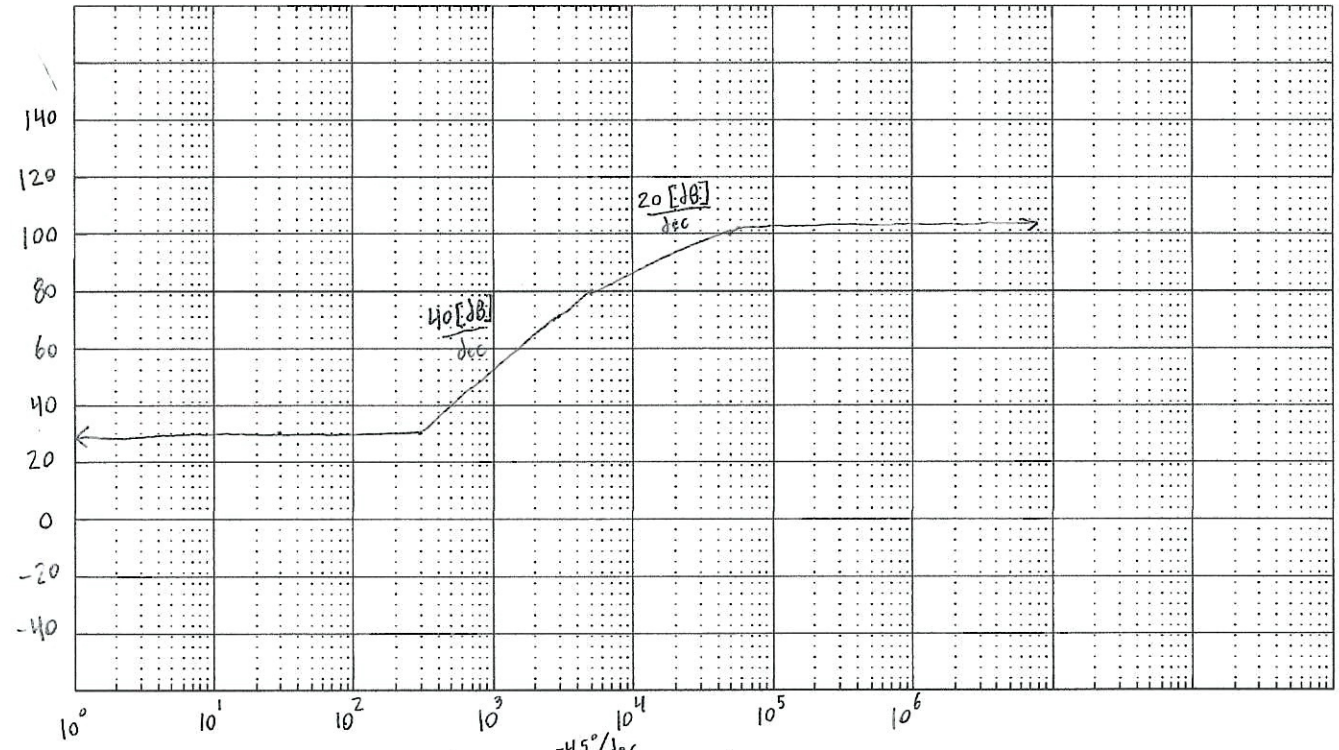
$\phi = 0^\circ$

$Z_1 = Z_2 = 300$

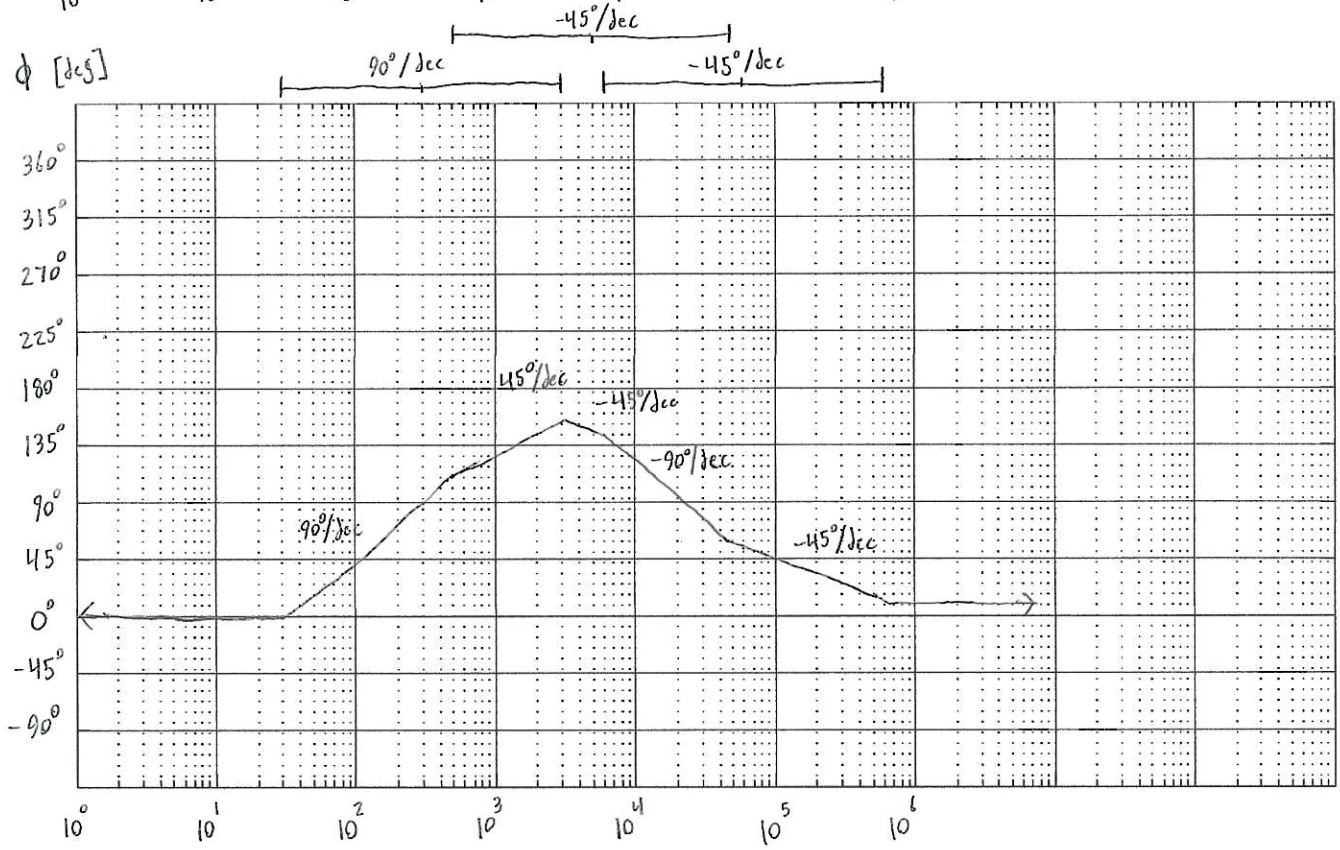
$P_1 = 5000$

$P_2 = 60000$

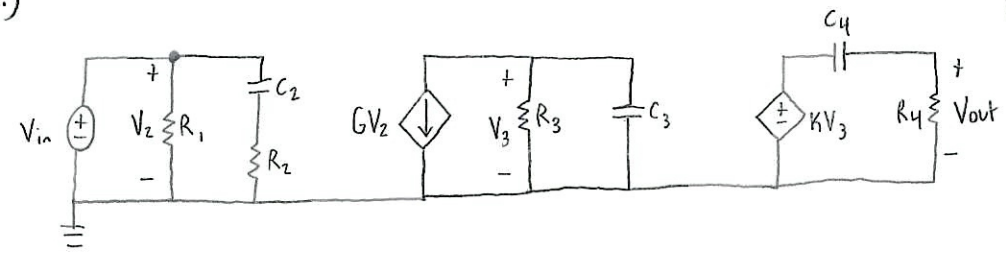
$|H(jw)|$ [dB]



ϕ [deg]



3.) a.)



$V_2 = V_{in}$

KCL (V_3): $GV_2 + \frac{V_3}{R_3} + \frac{V_3}{(1/jwC_3)} = 0$

$GV_2 + V_3\left(\frac{1}{R_3} + \frac{jwC_3}{1}\right) = 0$

$GV_2 + V_3\left[\frac{1+jwC_3R_3}{R_3}\right] = 0$

$GV_2 + V_3\left[\frac{1+jwC_3R_3}{R_3}\right] = 0$

$V_3 = -GV_2 \cdot \frac{R_3}{1+jwC_3R_3}$

$V_{out} = \frac{R_4}{1/jwC_4 + R_4} KV_3$

$= \frac{jwC_4R_4}{1+jwC_4R_4} KV_3$

$= -GV_2KR_3 \frac{jwC_4R_4}{(1+jwC_3R_3)(1+jwC_4R_4)}$

$$\frac{V_{out}}{V_{in}} = -GR_3K \cdot \frac{jwC_4R_4}{(1+jwC_3R_3)(1+jwC_4R_4)}$$

b.)

$$H(jw) = -10 \cdot 10 \cdot \frac{jw0.01}{(1+jw0.0001)(1+jw0.01)}$$

$$H(jw) = -100 \cdot \frac{j\frac{w}{100}}{(1+j\frac{w}{10000})(1+j\frac{w}{100})}$$

See next page for Bode Plots

3.) b.)

$w_0 = 10$

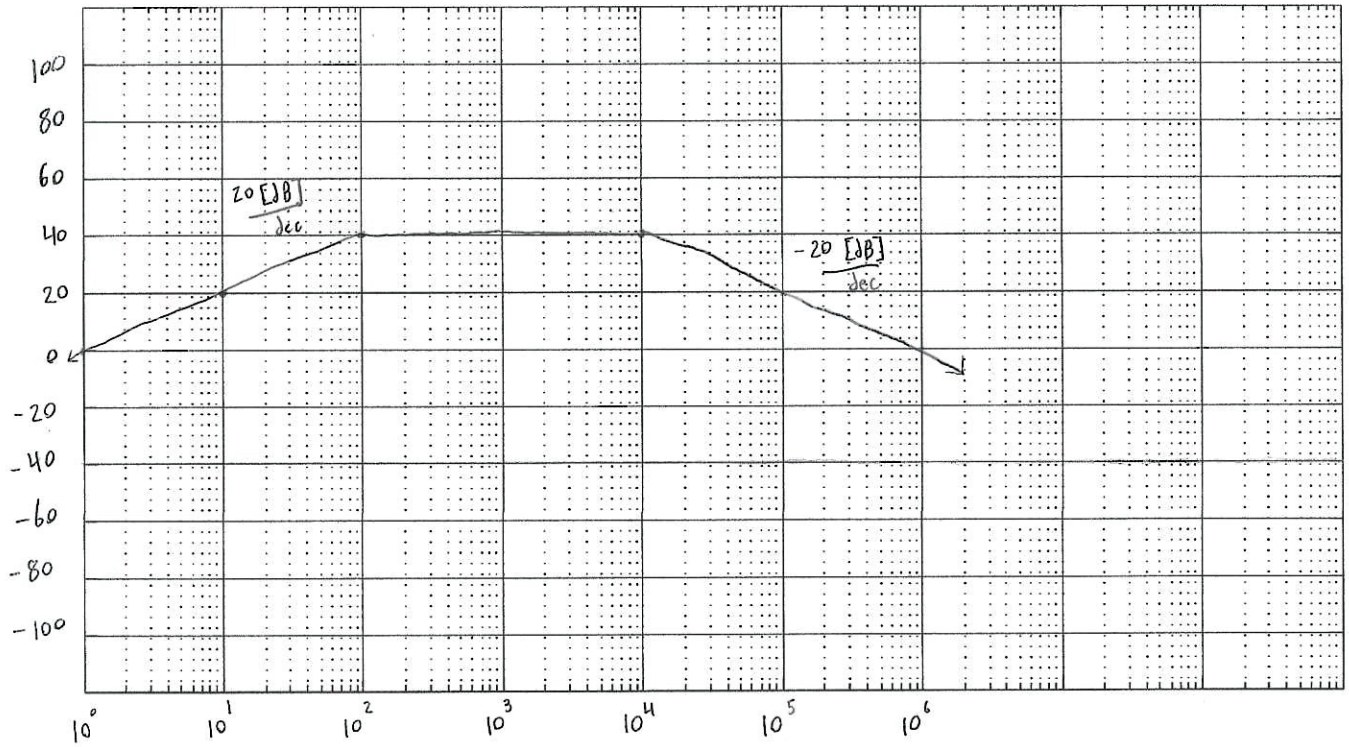
$H(j10) = -j10 \Rightarrow 20\ [dB]$

$\phi = -90^\circ$

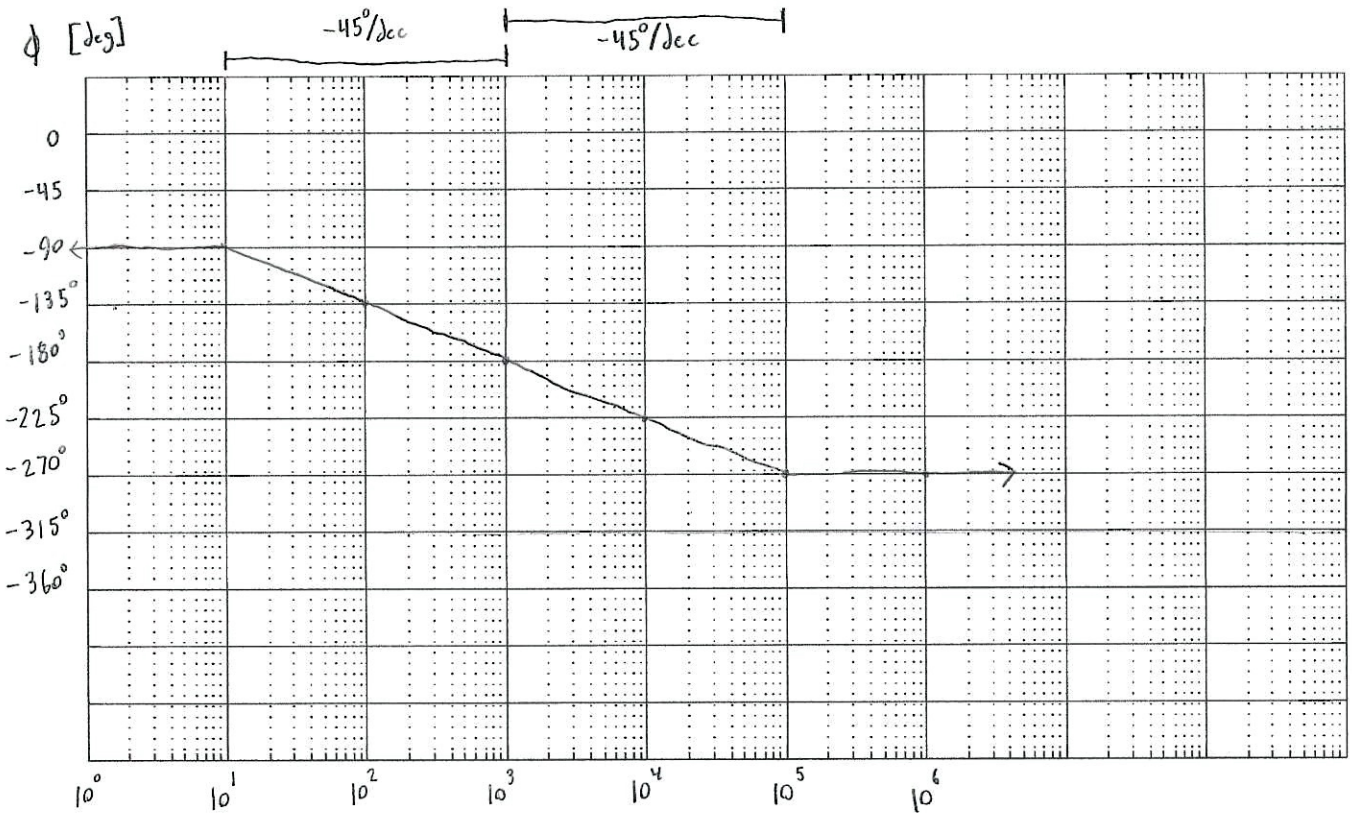
$p_1 = 100$

$p_2 = 10000$

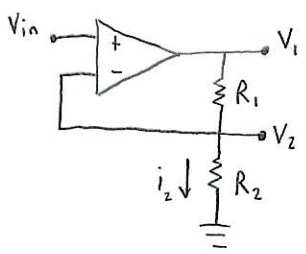
$|H(jw)|$ [dB]



ϕ [deg]



4.)



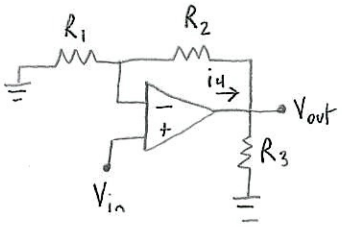
$V_2 = V_{in}$

$i_2 = \frac{V_{in}}{R_2}$

$V_1 = V_{in} + i_2 R_1 = V_{in} + V_{in}\frac{R_1}{R_2}$

$V_1 = V_{in}\left(1 + \frac{R_1}{R_2}\right)$

5.)



KCL: (V_-)

$\frac{-V_{in}}{R_1} = \frac{V_{in} - V_{out}}{R_2}$

$\frac{V_{out}}{R_2} = \frac{V_{in}}{R_1} + \frac{V_{in}}{R_2}$

$V_{out} = \left(1 + \frac{R_2}{R_1}\right) V_{in}$

$i_4 = \frac{V_{out}}{R_3} + \frac{V_{out} - V_{in}}{R_2}$

$= V_{out}\left(\frac{1}{R_3} + \frac{1}{R_2}\right) - \frac{V_{in}}{R_2}$

$= \left(1 + \frac{R_2}{R_1}\right)\left(\frac{1}{R_3} + \frac{1}{R_2}\right) V_{in} - \frac{V_{in}}{R_2}$

$= \left(\frac{1}{R_3} + \frac{1}{R_2} + \frac{R_2}{R_1 R_3} + \frac{1}{R_1}\right) V_{in} - \frac{V_{in}}{R_2}$

$i_4 = \left(\frac{1}{R_1} + \frac{1}{R_3} + \frac{R_2}{R_1 R_3}\right) V_{in}$