Two basic configurations with negative feedback

\[ Z_1, Z_2 \text{- some impedances} \]

"non-inverting" \( V_{in} = V_+ \)

Same as what we looked at during last lecture.

"closed loop gain": \( G_{CL} = \frac{V_{out}}{V_{in}} \)

\[ G_{CL} = \frac{G}{1+GH} = \frac{1}{H} \frac{1}{1+\frac{1}{GH}} \]

\( G_{CL} \approx \frac{1}{H} \) if \( |GH| \gg 1 \)

"neg. F.B. transfer fcn": \( H = \frac{V_{-}}{V_{out}} \)

\[ H = \frac{Z_1}{Z_1 + Z_2} \]

"loop gain": gain for signal going around a closed loop

\( GH \) - very important for stability

"inserting", \( V_{in} \rightarrow V_- \)

1) \( V_x = V_{in} \frac{Z_2}{Z_1 + Z_2} + V_{out} \frac{Z_1}{Z_1 + Z_2} \)

(superposition)

2) \( V_{out} = G(V_+ - V_-) = G(0 - V_x) \)

3) \( \Rightarrow G_{CL} = \frac{V_{out}}{V_{in}} = -\frac{GZ_2}{GZ_1 + Z_1 + Z_2} \)

4) introduce \( H' = \frac{Z_1}{Z_2} \), \( \Rightarrow G_{CL} = -\frac{1}{H'} \frac{1}{1 + \frac{1}{GH}} \)

"closed loop gain"

\[ G_{CL} = -\frac{1}{H'} \frac{1}{1 + \frac{1}{GH}} \]

\( G_{CL} \approx -\frac{1}{H} \) if \( |GH| \gg 1 \)

"loop gain" \( GH \)