Negative vs. positive feedback

Consider this circuit — negative feedback

\[ v_{OUT} = -\frac{R_2}{R_1} v_{IN} \]

and this — positive feedback

\[ v_{OUT} = -\frac{R_2}{R_1} v_{IN} \]

What is the difference?

Consider what happens when there is a perturbation

Positive feedback drives op amp into saturation:

\[ v_{OUT} \rightarrow \pm V_S \]
One use of instability: Build Comparator
Oscillator: Can Create a Clock

Assume $v_0=V_S$ at $t=0$, $v_c=0$
Physical Limitations of Op Amp

Voltage limit: \( V_S^- < v_{out} < V_S^+ \)
Frequency Response Limits

• The product of gain and band width in any given op-amp is constant, i.e. $A_\omega = K$
• Increasing the gain-bandwidth product by means of amplifiers in cascade.

Offset voltage limit
Slew rate limit