

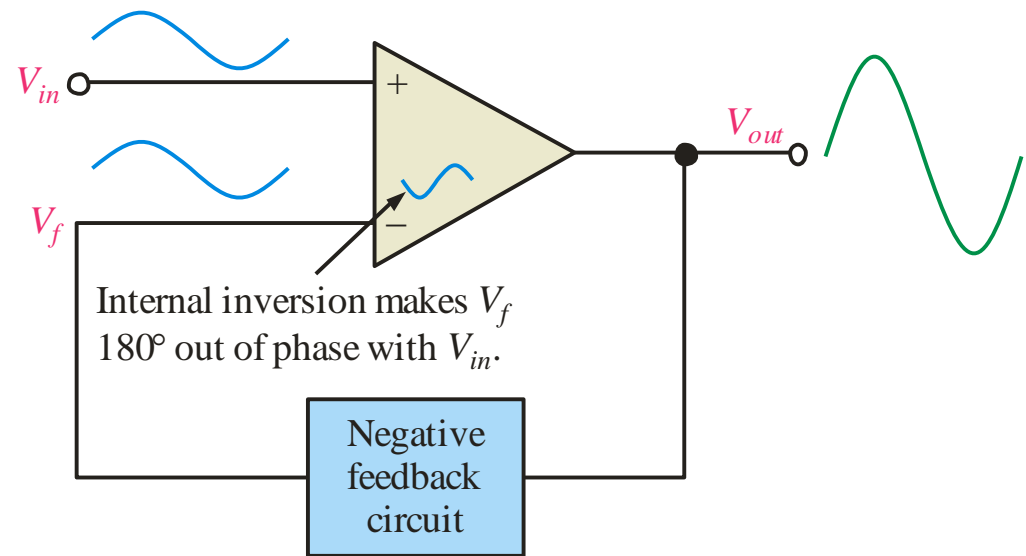
Lecture 11: Operational Amplifiers (2)

Negative Feedback, Closed Form Gain,
Noninverting Amplifier, Voltage Follower,
Inverting Amplifier, Input and Output Impedances

Negative Feedback

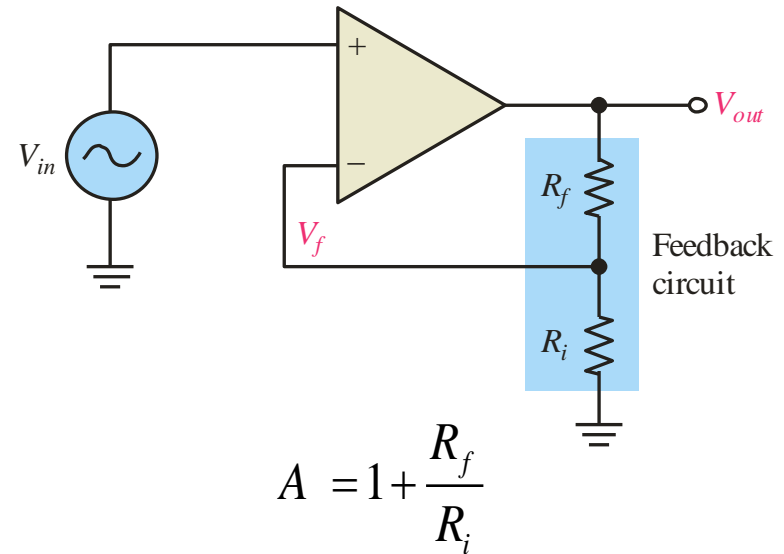
Negative feedback is the process of returning a portion of the output signal to the input with a phase angle that opposes the input signal.

The advantage of negative feedback is that precise values of amplifier gain can be set. In addition, bandwidth and input and output impedances can be controlled.



Noninverting Amplifier

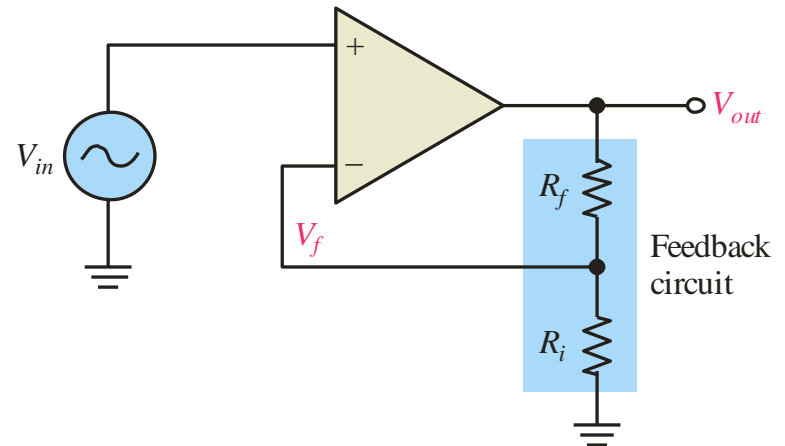
A **noninverting amplifier** is a configuration in which the signal is on the noninverting input and a portion of the output is returned to the inverting input.



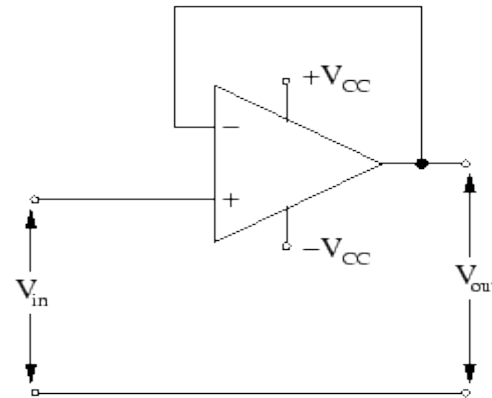
Voltage Follower

A voltage follower is a non-inverting amplifier with a gain of 1

It is used very often as a buffer block



R_f approaches 0 and R_i approaches ∞

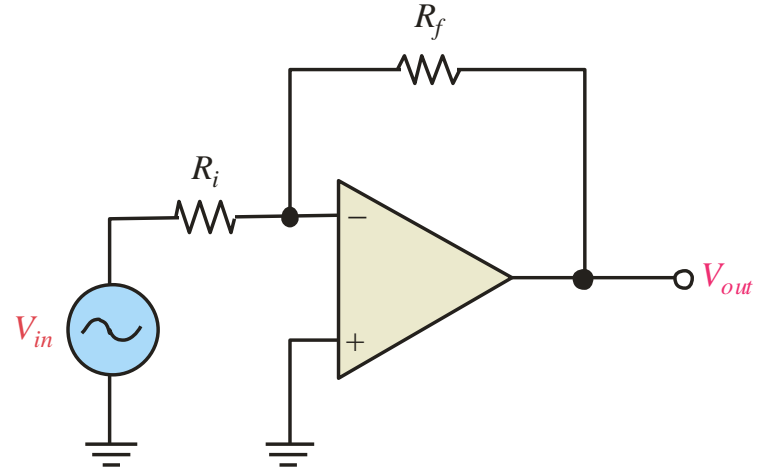


Inverting Amplifier

An **inverting amplifier** is a configuration in which the noninverting input is grounded and the signal is applied through a resistor to the inverting input.

Feedback forces the inputs to be nearly identical; hence the inverting input is very close to 0 V. The closed-loop gain of the inverting amplifier is

$$A_{cl(I)} = -\frac{R_f}{R_i}$$



Bandwidth Limitations

Many op-amps have a roll off rate determined by a single low-pass RC circuit, giving a constant -20 dB/decade down to unity gain.

Op-amps with this characteristic are called *compensated* op-amps. The blue line represents the open-loop frequency characteristic (Bode plot) for the op-amp.

