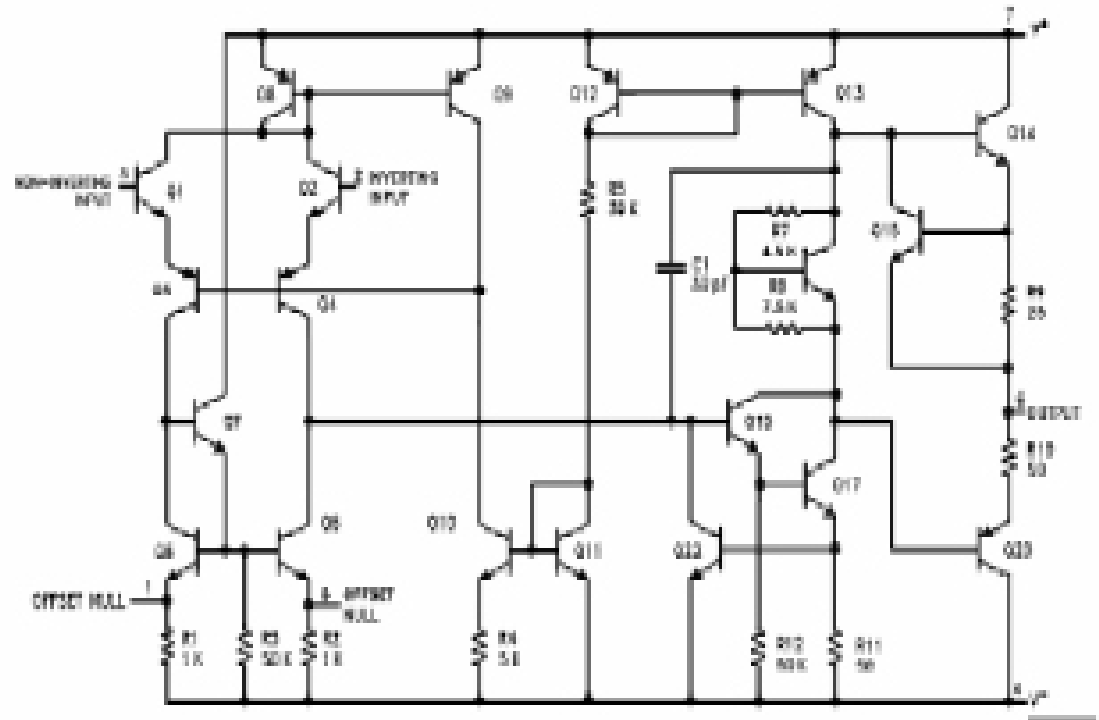

Today in Physics 217: simple active AC circuits

- ❑ Operational amplifiers (opamps)
- ❑ Amplification with opamps
- ❑ Arithmetic with opamps
- ❑ Integration and differentiation with opamps
- ❑ Analog computers



Circuit diagram for the venerable 741 opamp (National Semiconductor Corp.).

Passive and active circuit elements

The circuit elements we've seen so far – capacitors, resistors and inductors – are called **passive**. These devices always obey the same relation between their current and voltage, independent of how large or small the current or voltage is.

□ That is, they have the same **impedance** at all voltages.

Active electronic devices are those whose current-voltage properties (impedance) change with voltage.

□ Semiconductor diodes or vacuum tubes, for instance.

Some active devices can **amplify**: they allow one to control and change a large electrical power by changing a small electrical power, or vice versa.

□ Examples: transistors, vacuum-tube triodes, and circuits made from these devices.

Operational amplifiers

This is not a course in electronics; we will not discuss the details of transistors. But one particular class of transistor circuit that can provide amplification is simple enough to learn the basics of in a few minutes: the **operational amplifier**, or opamp.

- Internally, they're not simple, and the finest details of their performance is way beyond the scope of our discussion, but most of what they do can be described in only two concise statements.

Let's learn enough about opamps to use them in simple active AC circuits, thereby enriching substantially the number of AC-circuit situations in which you will be able to solve problems.