Negative Resistance?

Look at Negative Impedance Converter (NIC) - A 2 port circuit with negative input resistance

![Circuit Diagram]

Basically a non-inverting amplifier with $V_0 = V_S \left(1 + \frac{R_2}{R_1}\right)$

True because $R_3$ does not affect voltage at non-inverting input, $V_S$ is an independent source.

So, $V_0 = V_S \left(1 + \frac{R_2}{R_1}\right)$ and $I_{in} = \frac{V_S - V_0}{R_3}$

Thus,

$\frac{I_{in}}{V_S} = \frac{1}{R_1 R_3}$

$\frac{V_S}{I_{in}} = -R_3 \left(\frac{R_1}{R_2}\right)$

$R_{in} = -R_3 \left(\frac{R_1}{R_2}\right)$ \iff negative input resistance

This circuit injects energy into the circuit unlike a normal resistor that consumes power from the circuit.
Every circuit composed of linear components of types

\[ \pm, \uparrow, \downarrow, \oplus, \ominus, \uplus, \uplusminus \]

has a linear I/V relationship.

We can make a simplified circuit (therein equiv) with a VSCC + resistor.

\[ \text{A resistor looks like this:} \]

\[ \text{A negative resistor looks like:} \]