If we consider the simple circuit of Figure 3.17, we fnd it has the ***v-i*** relation at its terminals of



Comparing the two **v-i** relations, we fnd that they have the same form. In this case the **Thevenin equivalent resistance** is ***R*eq = ( *R*1 || *R*2 )** and the **Thevenin equivalent source** has voltage



Thus, from viewpoint of the terminals, you cannot distinguish the two circuits. Because the equivalent circuit has fewer elements, it is easier to analyze and understand than any other alternative.

For *any* circuit containing resistors and sources, the *v-i* relation will be of the form

and the **Thevenin equivalent circuit** for any such circuit is that of [Figure 3.17](#_bookmark105). This equivalence applies no matter how many sources or resistors may be present in the circuit. In the example (Example 3.2) below, we know the circuit's construction and element values, and derive the equivalent source and resistance. Because Thevenin's theorem applies in general, we should be able to make measurements or calculations **only from the terminals** to determine the equivalent circuit.

To be more specifc, consider the equivalent circuit of this fgure ([Figure 3.17](#_bookmark105)). Let the terminals be opencircuited, which has the efect of setting the current i to zero.

Because no current fows through the resistor, the voltage across it is zero (remember, Ohm's Law says that ***v*** = ***Ri***). Consequently, by applying KVL we have that the so-called open-circuit voltage *voc* equals the Thevenin equivalent voltage. Now consider the situation when we set the terminal voltage to zero (short-circuit it) and measure the resulting current. Referring to the equivalent circuit, the source voltage now appears entirely across the resistor, leaving the short-circuit current to be



. From this property, we can determine the equivalent resistance.

