1.30 Find \( v \) and \( i \) for the series-parallel circuit shown in Fig. P1.30.

1.31 Find \( v \) and \( i \) for the series-parallel circuit shown in Fig. P1.31.

1.32 Consider the circuit shown in Fig. P1.32. (a) Find \( i, v_1, v_2, \) and \( v_3 \). (b) Remove the short circuit between \( a \) and \( b \) (erase it), and find \( i, v_1, \) and \( v_2 \). (Don’t try to find \( v_3 \)—it can’t be done!)

1.33 Consider the series-parallel circuit shown in Fig. P1.33. (a) Find \( V_1 \) when \( v_1 = 2 \) V. (b) Find \( V_1 \) when \( i_3 = 3 \) A. (c) Find \( V_1 \) when \( i_5 = 4 \) A. (d) What is the resistance \( R_{eq} = V_1/i \) loading the battery for part (a)? For part (b)? For part (c)?
1.34 Consider the nonseries-parallel circuit shown in Fig. P1.34. (a) When \( R = \frac{1}{2} \) \( \Omega \), then \( v_1 = 6 \) V. Determine the resistance \( R_{eq} = V_{eq}/I \) loading the battery.

1.35 Consider the nonseries-parallel circuit shown in Fig. P1.34. When \( R = 4 \) \( \Omega \), then \( v_1 = 4 \) V. Determine the resistance \( R_{eq} = V_{eq}/I \) loading the battery.

1.36 Consider the nonseries-parallel circuit shown in Fig. P1.34. Determine \( R \) and the resistance \( R_{eq} = V_{eq}/I \) loading the battery when \( v_1 = 3 \) V.
1.44 Consider the circuit shown in Fig. P1.44. Find \(v\) when (a) \(K = 2\), and (b) \(K = 4\).

1.45 Consider the circuit shown in Fig. P1.45. Find \(i\) when (a) \(K = 2\), and (b) \(K = 4\).

1.46 Consider the circuit shown in Fig. P1.46. (a) Find the resistance \(R_{eq} = v_i/i_i\). (b) Find the voltage \(v_2\) in terms of the applied voltage \(v_1\).

1.47 Consider the circuit shown in Fig. P1.47. (a) Find the resistance \(R_{eq} = v_i/i_i\). (b) Use voltage division to find \(v\) in terms of \(v_2\). (c) Find the voltage \(v_2\) in terms of the applied voltage \(v_1\).

1.48 For the circuit shown in Fig. P1.48, suppose that \(R = 10\) \(\Omega\). Determine (a) \(v_1\), and (b) \(R_{eq} = v_i/i_i\).

1.49 For the circuit shown in Fig. P1.48, suppose that \(R = 8\) \(\Omega\). Determine (a) \(v_1\), and (b) \(R_{eq} = v_i/i_i\).
1.50 For the circuit shown in Fig. P1.50, suppose that $R = 5 \, \Omega$. Determine (a) $i_s$, and (b) $R = v_s/i_s$.

![Fig. P1.50](image)

1.51 For the circuit shown in Fig. P1.50, suppose that $R = 3 \, \Omega$. Determine (a) $i_s$, and (b) $R_{eq} = v_s/i_s$.

1.52 The circuit shown in Fig. P1.52 is a single field-effect transistor (FET) amplifier in which the input is $v_1$ and the output is $v_2$. The portion of the circuit in the shaded box is an approximate model of an FET. (a) Find $v_{gs}$ in terms of $v_1$. (b) Find $v_2$ in terms of $v_1$. (c) Find $v_2$ when $v_1 = 0.1 \cos 120\pi t \, V$.

![Fig. P1.52](image)

1.53 The circuit shown in Fig. P1.53 is a single bipolar junction transistor (BJT) amplifier in which the input is $v_1$ and the output is $v_2$. The portion of the circuit in the shaded box is an approximate model of a BJT in the common-emitter configuration. (a) Find $i_e$ in terms of the input voltage $v_1$. (b) Find the output voltage $v_2$ in terms of $v_1$. (c) Find $v_2$ when $v_1 = 0.1 \cos 120\pi t \, V$.

![Fig. P1.53](image)

1.54 The circuit shown in Fig. P1.54 is another single bipolar junction transistor (BJT) amplifier in which the input is $v_1$ and the output is $v_2$. The portion in the shaded box is an approximate model of a BJT in the common-base configuration. (a) Find $i_e$ in terms of the input voltage $v_1$. (b) Find the output voltage $v_2$ in terms of $v_1$. (c) Find $v_1$ when $v_1 = 0.1 \cos 120\pi t \, V$.

1.55 For the circuit given in Fig. 1.51 on p. 34, $v = 12 \, V$, $i_1 = 4 \, A$, and $i_2 = 6 \, A$. Determine the power absorbed by each element in the circuit.

1.56 For the circuit given in Fig. 1.52 on p. 36, $v = 24 \, V$. Determine the power absorbed by each element in the circuit.