P10.36* (a) D_1 is on and D_2 is off. $V = 10$ volts and $I = 0$.

(b) D_1 is on and D_2 is off. $V = 6$ volts and $I = 6$ mA.

(c) Both D_1 and D_2 are on. $V = 30$ volts and $I = 33.6$ mA.

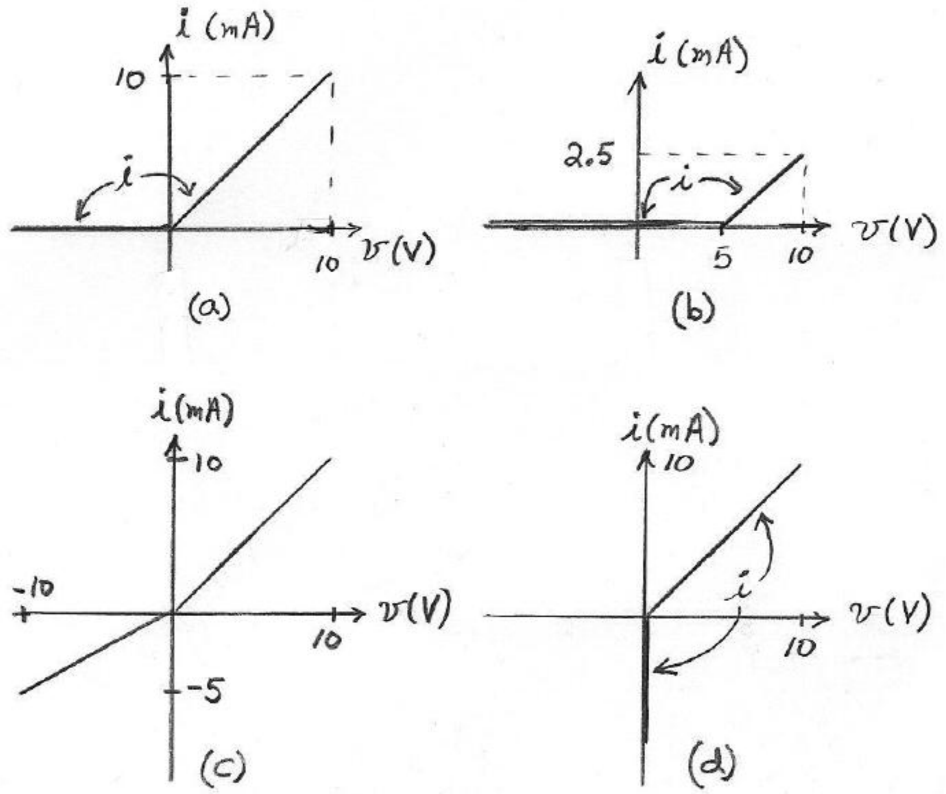
P10.37 (a) The diode is on, $V = 0$ and $I = \frac{10}{5000} = 2\,\text{mA}$.

(b) The diode is off, $I = 0$ and $V = 5\,\text{V}$.

(c) The diode is on, $V = 0$ and $I = \frac{6}{3000} = 2\,\text{mA}$.

(d) The diode is on, $I = 3$ mA and $V = 6\,\text{V}$.

P10.40



P10.48 (a) Assuming that the diode is an open circuit, we can compute the node voltages using the voltage-division principle.

$$V_1 = 16\frac{300}{100 + 300} = 12\,\text{V} \quad V_2 = 16\frac{200}{200 + 200} = 8\,\text{V}$$

Then, the voltage across the diode is $v_D = v_1 - v_2 = 4$ V. Because v_D is greater than V_f =0.7 V, the diode is in fact operating as an closed circuit.

(b) Assuming that the diode operates as a voltage source, we can use KVL to write:

$$v_1 - v_2 = 0.7$$

Placing a closed surface around the diode to form a super node and writing a KCL equation gives

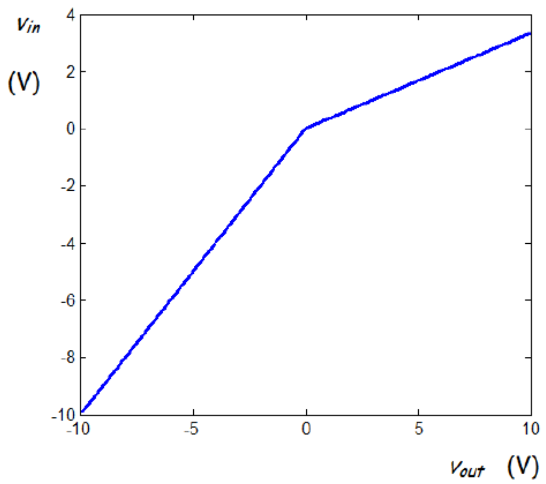
$$\frac{v_1 - 16}{100} + \frac{v_1}{300} + \frac{v_2 - 16}{100} + \frac{v_2}{200} = 0$$

Solving these equations, we find $v_1 = 11.665$ V and $v_2 = 9.965$ V. Then, writing a KCL equation at node 1 gives the diode current.

$$i_D = \frac{16 - v_1}{100} - \frac{v_1}{300} = 4.47\ \text{mA}$$

Because the diode current is positive, the diode operation is consistent with the model.

P10.63



P10.64 Refer to Figure P10.64 in the book. When the source voltage is positive, diode D_3 is on and the output $v_o(t)$ is zero. For source voltages between 0 and 5 V, none of the diodes conducts and $v_o(t) = v_s(t)$. Finally, when the source voltage falls below -5 V, D_1 is on and D_2 is in the breakdown region so the output voltage is 5 V. The waveforms are: