Chapter 7, Solution 86.

$$v(t) = v(\infty) + \left[v(0) - v(\infty) \right] e^{-t/\tau}$$
$$v(\infty) = 12, \qquad v(0) = 0$$
$$v(t) = 12\left(1 - e^{-t/\tau}\right)$$
$$v(t_0) = 8 = 12\left(1 - e^{-t_0/\tau}\right)$$
$$\frac{8}{12} = 1 - e^{-t_0/\tau} \longrightarrow e^{-t_0/\tau} = \frac{1}{3}$$
$$t_0 = \tau \ln(3)$$

For $R = 100\ k\Omega$,

$$\tau = RC = (100 \times 10^3)(2 \times 10^{-6}) = 0.2\ s$$
$$t_0 = 0.2 \ln(3) = 0.2197\ s$$

For $R = 1\ M\Omega$,

$$\tau = RC = (1 \times 10^6)(2 \times 10^{-6}) = 2\ s$$
$$t_0 = 2 \ln(3) = 2.197\ s$$

Thus,

$$\mathbf{0.2197\ s < t_0 < 2.197\ s}$$