Chapter 7, Solution 39.

(a) Before t = 0,

$$v(t) = \frac{1}{4+1}(20) = \mathbf{4\ V}$$

After t = 0,

$$v(t) = v(\infty) + \left[\, v(0) - v(\infty) \right] e^{-t/\tau}$$

$$\tau = RC = (4)(2) = 8, \quad v(0) = 4, \qquad v(\infty) = 20$$

$$v(t) = 20 + (4 - 20)\,e^{-t/8}$$

$$v(t) = 20 - 16e^{-t/8}\ \mathrm{V}$$

(b) Before t = 0, $v = v_1 + v_2$, where v_1 is due to the 12-V source and v_2 is due to the 2-A source.

$$v_1 = 12\ \mathrm{V}$$

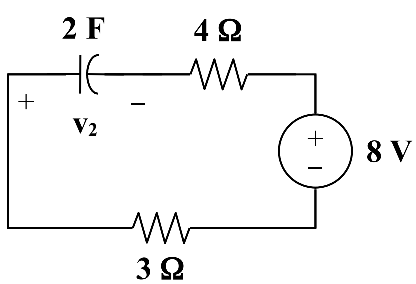
To get v_2, transform the current source as shown in Fig. (a).

$$v_2 = -8\ \mathrm{V}$$

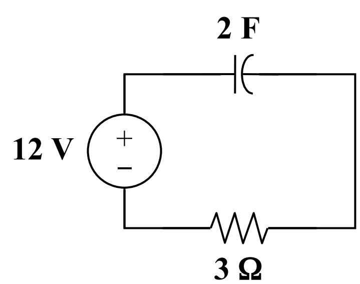
Thus,

$$v = 12 - 8 = \mathbf{4\ V}$$

After t = 0, the circuit becomes that shown in Fig. (b).



(a)



(b)

$$v(t) = v(\infty) + \left[\, v(0) - v(\infty) \right] e^{-t/\tau}$$

$$v(\infty) = 12, \qquad v(0) = 4, \qquad \tau = RC = (2)(3) = 6$$

$$v(t) = 12 + (4 - 12)\,e^{-t/6}$$

$$v(t) = \mathbf{12 - 8e^{-t/6}\ V}$$