P3.34.

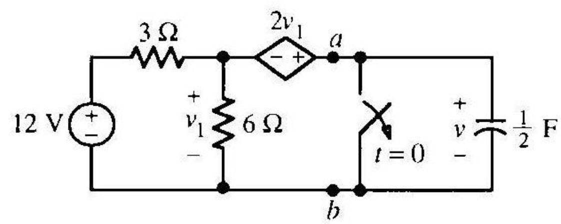
$$\tau = \frac{1\,H}{1+1\|1} = \frac{1}{1.5}\ s$$

$$v(0) = (100-50)\times(1\|1) = 25\,V$$

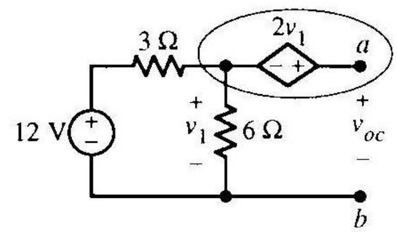
$$v(\infty) = 100\times(1\|1\|1) = 33.3\,V$$

$$\Rightarrow v(t) = 33.3 + (25-33.3)\times e^{-1.5t}$$

17. (a)



Calculate the open-circuit voltage.



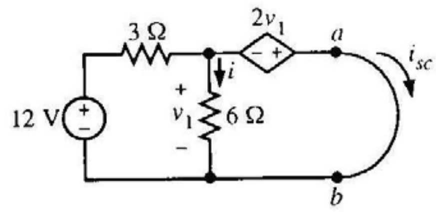
KCL gives

$$\tfrac{1}{3}(v_1 - 12) + \tfrac{1}{6}v_1 = 0$$

$$v_1 = 8\ \text{V}$$

KVL gives $v_{oc} = 2v_1 + v_1 = 3v_1 = 3(8) = 24\ \text{V}$

Calculate the short-circuit current



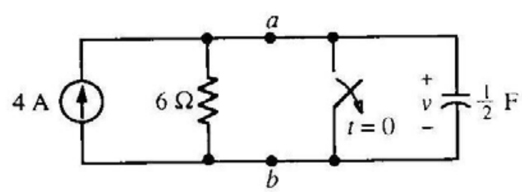
KVL for the right-hand mesh yields

$-v_1 - 2v_1 = 0 \Rightarrow v_1 = 0$

KCL gives $\frac{1}{3}(-12) + \frac{1}{6}(0) + i_{sc} = 0 \Rightarrow i_{sc} = 4$ A

$R_{Th} = R_N = \frac{v_{oc}}{i_{sc}} = \frac{24}{4} = 6\ \Omega$

Our equivalent circuit is



With the switch closed, we obviously have $v(0^-) = 0$ V so $v(0^+) = 0$ V

With the switch open, KCL gives

$-4 + \frac{1}{6}v + \frac{1}{2}\frac{d}{dt}v = 0$

$\frac{d}{dt}v + \frac{1}{3}v = 8$

$0v_p + \frac{1}{3}v_p = 8 \Rightarrow v_p = 24 \text{ V} \quad t > 0$

$s + \frac{1}{3} = 0 \Rightarrow s = -\frac{1}{3} \Rightarrow v_n = Ae^{-\frac{1}{3}t}$

$v = v_p + v_n = 24 + Ae^{-\frac{1}{3}t}$

$v(0^+) = 0 = 24 + Ae^0 \Rightarrow A = -24$

$\boxed{v = 24 - 24e^{-\frac{1}{3}t} \text{ V} \quad t > 0}$

(b) For the original circuit KVL gives $-v_1 - 2v_1 + v = 0 \Rightarrow v_1 = \frac{1}{3}v \quad t > 0$

Select b for the reference node. KCL for the supernode gives

$$\frac{1}{2}\frac{d}{dt}v+\frac{1}{6}\left(\frac{1}{3}v\right)+\frac{1}{3}\left(\frac{1}{3}v-12\right)=0$$

$$\frac{d}{dt}v+\frac{1}{3}v=8 \quad t>0$$

This equation is identical to that obtained in part (a), so the solution is identical.