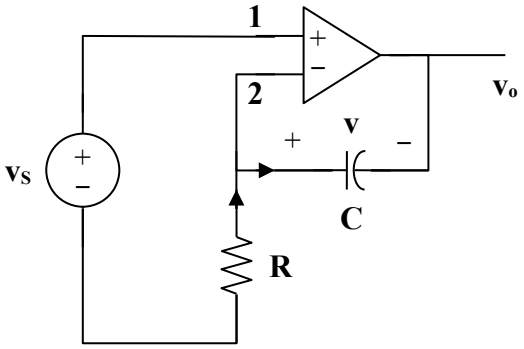
**Chapter 7, Solution 70.**

Let v = capacitor voltage.

For t < 0, the switch is open and $v(0) = 0$.

For t > 0, the switch is closed and the circuit becomes as shown below.




$$v_1 = v_2 = v_s \tag{1}$$

$$\frac{0 - v_s}{R} = C\frac{dv}{dt} \tag{2}$$

where $v = v_s - v_o \longrightarrow v_o = v_s - v$ (3)

From (1),

$$\frac{dv}{dt} = \frac{v_s}{RC} = 0$$

$$v = \frac{-1}{RC}\int v_s\, dt + v(0) = \frac{-t\, v_s}{RC}$$

Since v is constant,

$$RC = (20\times10^{3})(5\times10^{-6}) = 0.1$$

$$v = \frac{-20t}{0.1}\ \text{mV} = -200t\ \text{mV}$$

From (3),

$$v_o = v_s - v = 20 + 200t$$

$$\mathbf{v_o = 20(1 + 10t)\ mV}$$