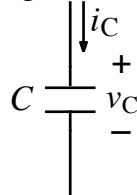


**Ex:** In (a)-(c), the voltage  $v_C(t)$  across a  $0.2 \mu\text{F}$  capacitor is listed. Find the current,  $i_C(t)$ , flowing in the capacitor in each case as a function of time:



- a)  $v_C(t) = 3 \text{ V}$
- b)  $v_C(t) = 1000t \text{ V/s}$
- c)  $v_C(t) = 1 - e^{-t/4\text{ms}} \text{ V}$

**SOL'N:** We use the defining equation for a capacitor in each case:

$$i_C = C \frac{dv_C}{dt}$$

a)

$$i_C = C \frac{d}{dt} 3 \text{ V} = 0 \text{ A}$$

b)

$$i_C = C \frac{d}{dt} 1000t \text{ V/s} = 0.2 \mu\text{F} \cdot 1000 \text{ V/s} = 200 \mu\text{A} \text{ or } 0.2 \text{ mA}$$

c)

$$i_C = C \frac{d}{dt} (1 - e^{-t/4\text{ms}}) \text{ V} = 0.2 \mu\text{F} \cdot \left( -\frac{-1}{4\text{ms}} e^{-t/4\text{ms}} \right) = 50 \mu\text{A} e^{-t/4\text{ms}}$$