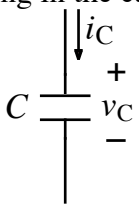
HOMEWORK #9 prob 1 solution

EX: In (a)-(c), the voltage $v_C(t)$ across a 0.2 μF capacitor is listed. Find the current, $i_C(t)$, flowing in the capacitor in each case as a function of time:



a) $v_C(t) = 3$ V

b) $v_C(t) = 1000t$ V/s

c) $v_C(t) = 1 - e^{-t/4\text{ms}}$ 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)

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

c)

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