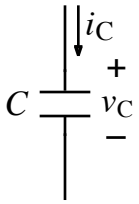
HOMEWORK #7 prob 3 solution

EX: In (a) and (b), the voltage $v_C(t)$ across a 30 nF capacitor is listed. Find the current, $i_C(t)$, flowing in the capacitor in each case as a function of time:



a) $v_C(t) = 0\ \text{V}$

b) $v_C(t) = 4\,\text{V} + \dfrac{5\,\text{Vs}}{1\,\text{s} + t}$

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

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

a)

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

b)

$$i_C = C\frac{d}{dt}\left(4\,\text{V} + \frac{5\,\text{Vs}}{1\,\text{s} + t}\right) = 30\ \text{nF}\cdot\left[-\frac{5}{(1\,\text{s} + t)^2}\right]\text{V/s} = -\frac{150}{(1 + t/\text{s})^2}\,\text{nA}$$