ECE 1270
S 09
HOMEWORK #10 solution

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Ex: Find the voltage, v_C, across the capacitor in the circuit below for $t > 0$ if $v_C(t = 0) = 5$ V.

C=5 μF

$+$ v_C $-$

R=2 Ω
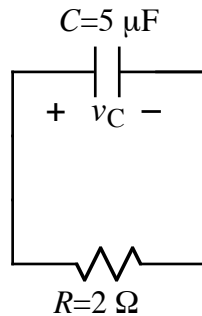
Sol'n: The same current flows in both the C and R, and the voltages are the same except for a minus sign:

$$i_C = C\frac{dv_C}{dt} = \frac{-v_C}{R} = i_R$$

Sol'n: The form of solution is an exponential.

$$v_C(t) = ke^{-t/RC}$$

The value of the constant, k, is chosen to match the initial voltage on C, since the exponential has a value of unity at $t = 0$: $e^0 = 1$.

$$v_C(t) = 5 \text{ V} \cdot e^{-t/10 \text{ μs}}$$