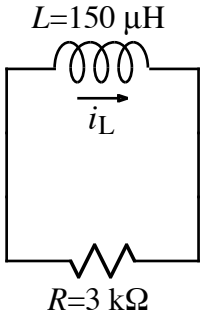
HOMEWORK #10 prob 1 solution

EX: Find the current, i_L, through the inductor in the circuit below for $t > 0$ if $i_L(t = 0) = 100$ μA.



SOL'N: The same current flows in both the L and R, and the voltages are the same except for a minus sign:

$$v_L = L\frac{di_L}{dt} = -i_L R = -v_R$$

The inductor current, i_L, that solves this equation is an exponential:

$$i_L(t) = Ae^{-t/(L/R)} = Ae^{-t/50\text{ns}}$$

To satisfy the initial condition as given for $t = 0$, the value of the constant A must be 100 μA since the exponential has a value of unity: $e^0 = 1$.

$$i_L(t > 0) = 100\ \mu\text{A}\ e^{-t/50\text{ns}}$$