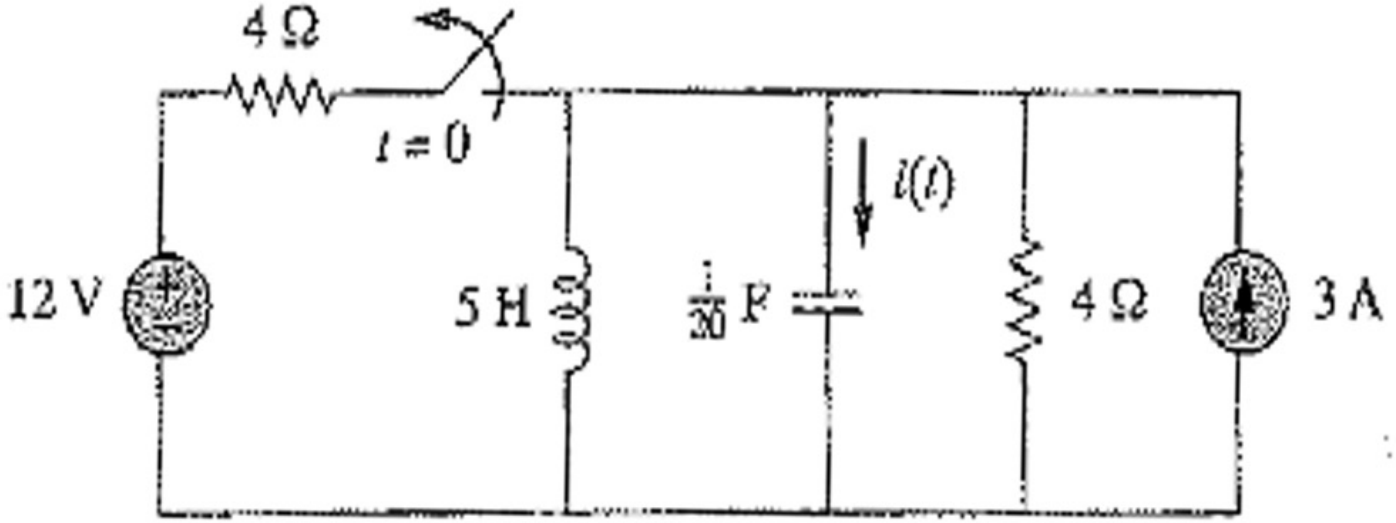
Lecture 38
2nd Order Transients – 4 of 4

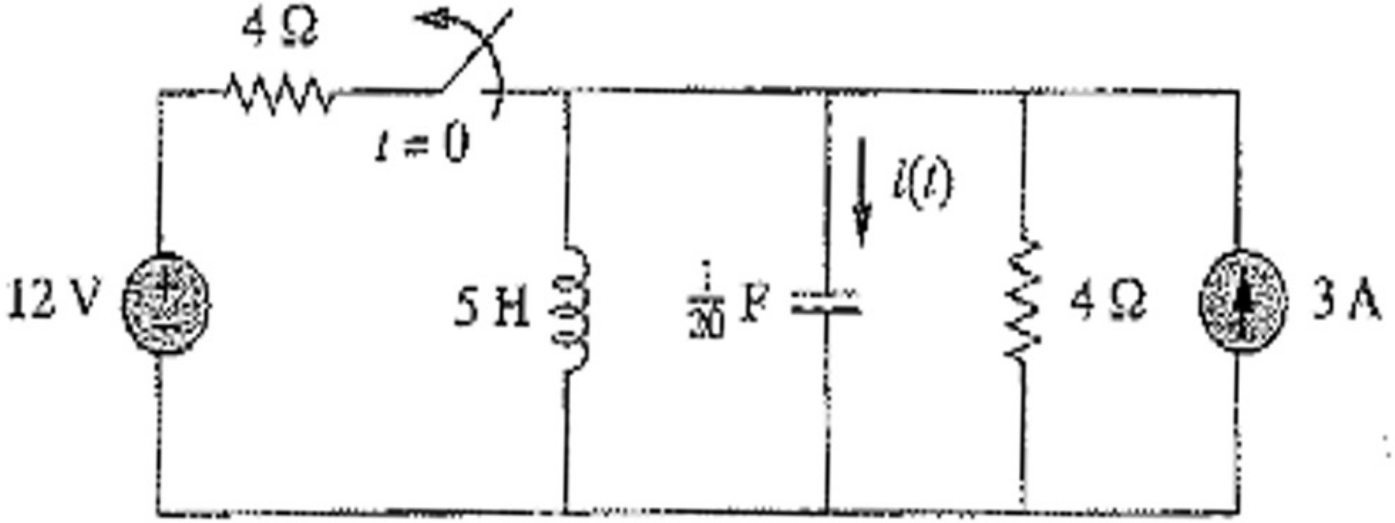
examples

Beyond $i_L(t)$ or $v_C(t)$

1. Identify type (series/parallel) and values of R,L,C
2. Root characteristic equation, to find form
3. Find $i_L(0)$ and $v_C(0)$
4. For variable of interest, find $x(0), x'(0)$, and $x(\infty)$
   - Note that the derivative might be hard to find; alternatively, could solve for $i_L(t)$ or $v_C(t)$ and then "propagate" that answer to the desired variable
5. Assemble answer

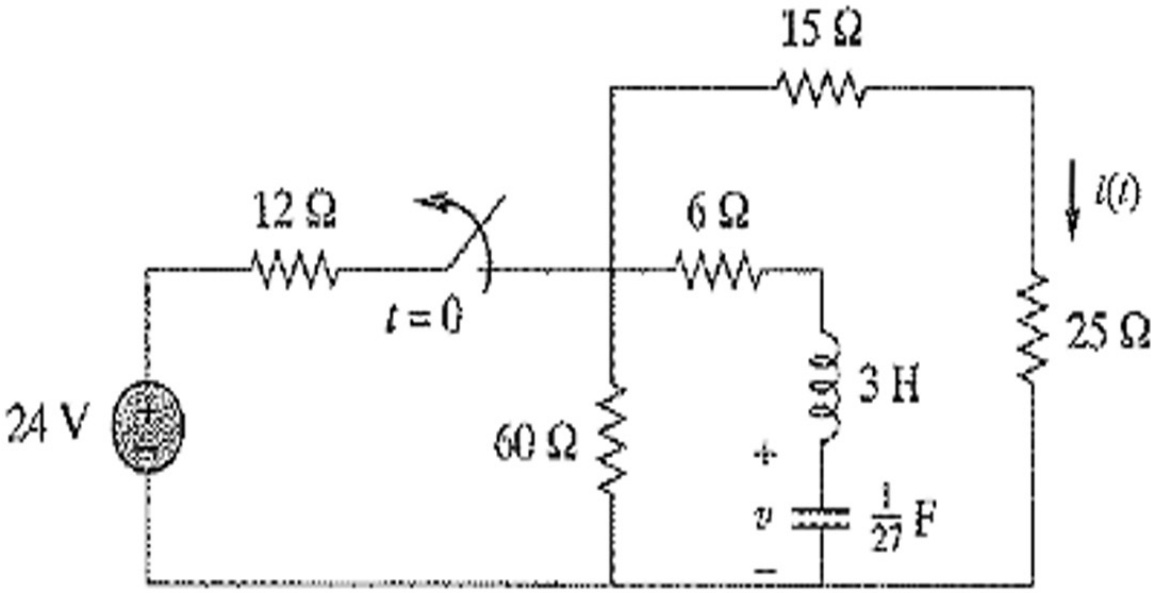
Example: find the capacitor current for $t > 0$. Hint, try v_c instead.

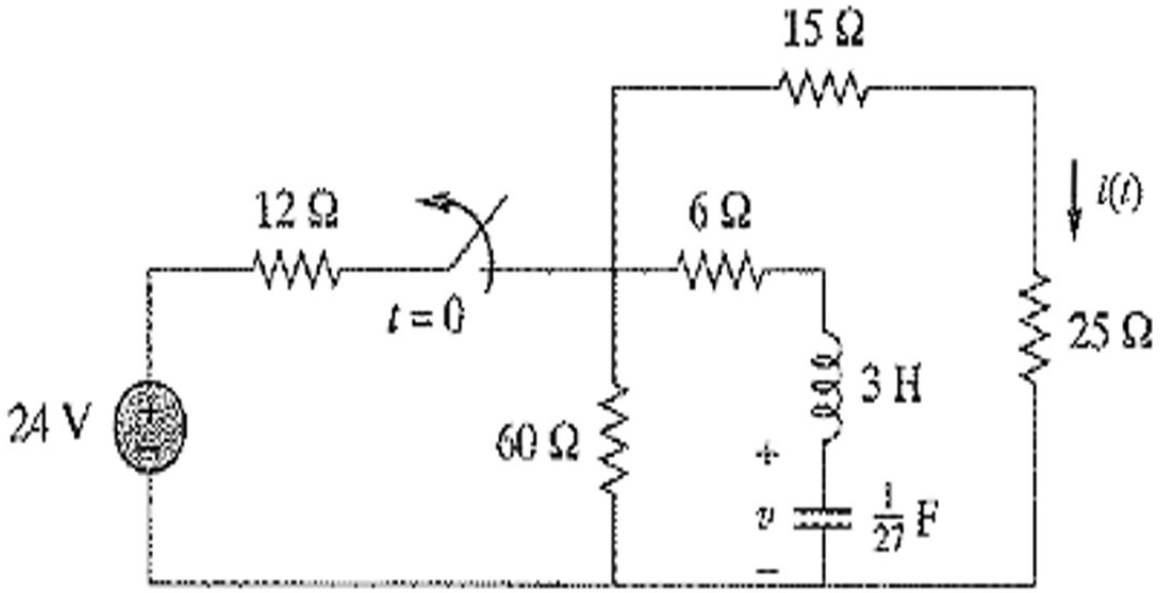




$$i(t) = e^{-t} - e^{-4t} A$$

Example: Find the 25 ohm resistor's current for $t > 0$



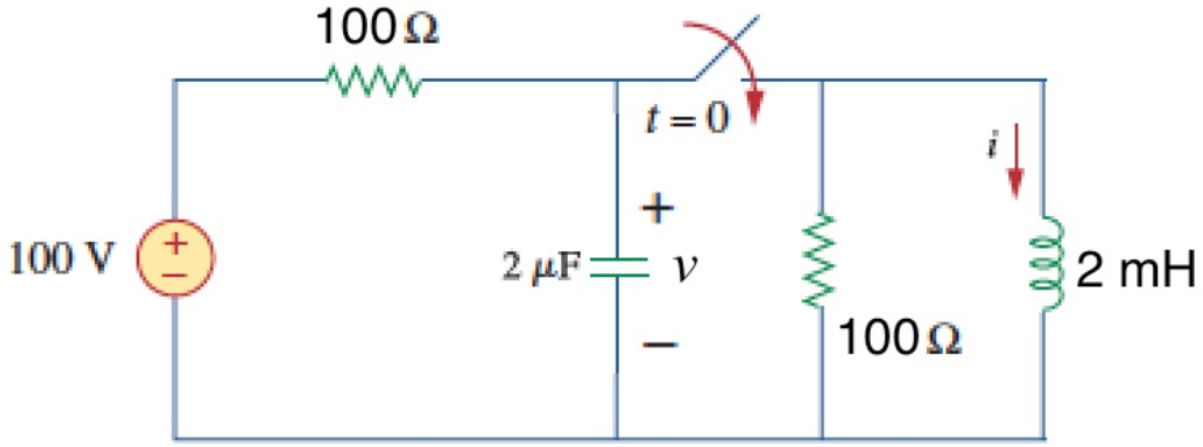


$$v(t) = 27e^{-t} - 3e^{-9t}\ V$$

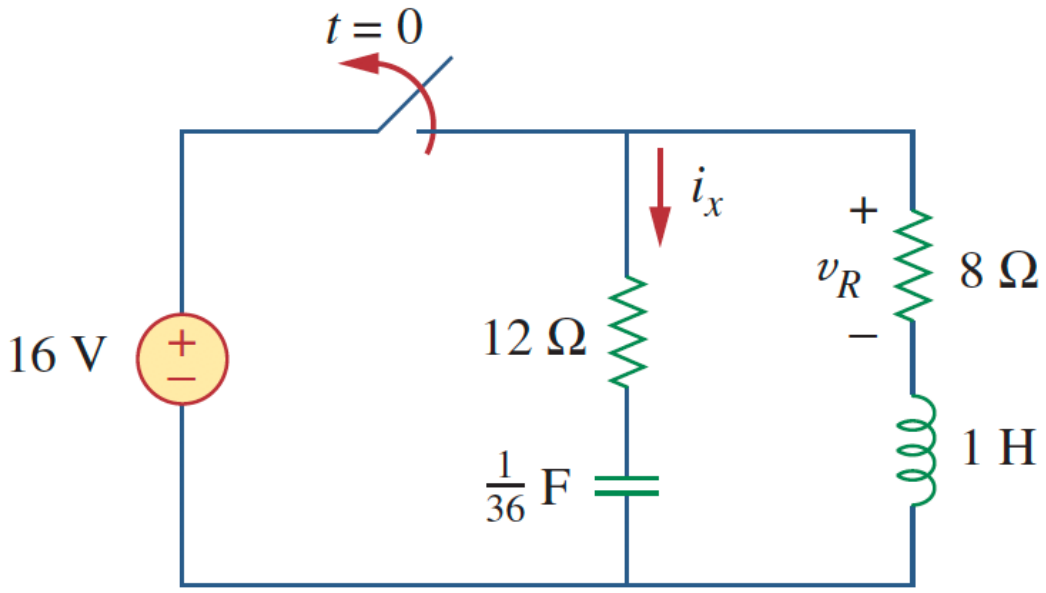
$$i_{25}(t) = 0.6(e^{-t} - e^{-9t})\ A$$

Other Situations

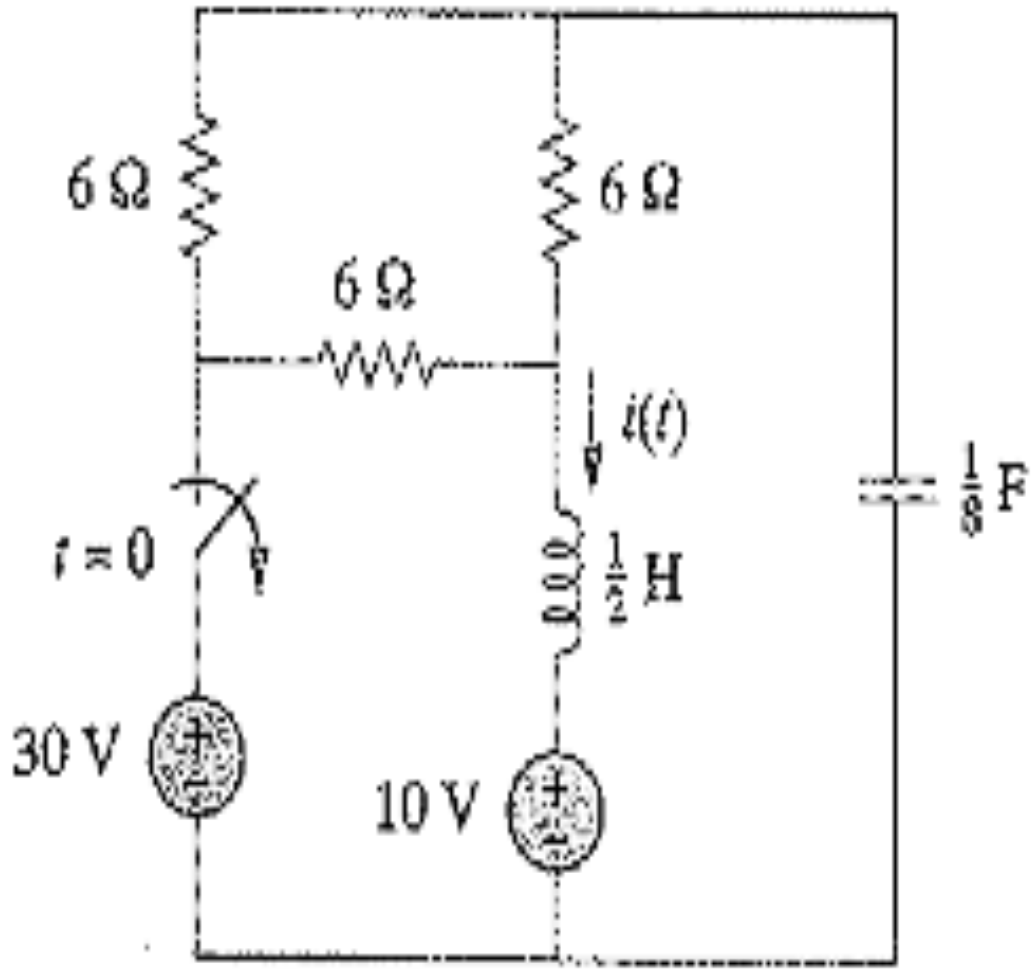
Switch opens? Switch closes?



- Switch opens? Switch closes?



- Switch opens? Switch closes?



What would you do here if the input was a unit step?