

## RL with a Source

Having found the current characteristics of the circuit it is easy to use that information to find  $V_L$ .

$$i(t) = \frac{E}{R}(1 - e^{-\frac{R}{L}t}), t > 0$$

And we know from the ideal relations that

$$V_L = L \frac{di}{dt} = L \frac{di(t)}{dt}$$

Which we can then use to find that

$$L \frac{d}{dt} \frac{E}{R} (1 - e^{-\frac{R}{L}t}), t > 0$$

Which simplifies after differentiating to

$$V_L = E e^{-\frac{R}{L}t}$$

Then, by KVL you can find  $V_R$  by either

$$V_R = Eu(t) - V_L$$

or

$$V_R = iR$$