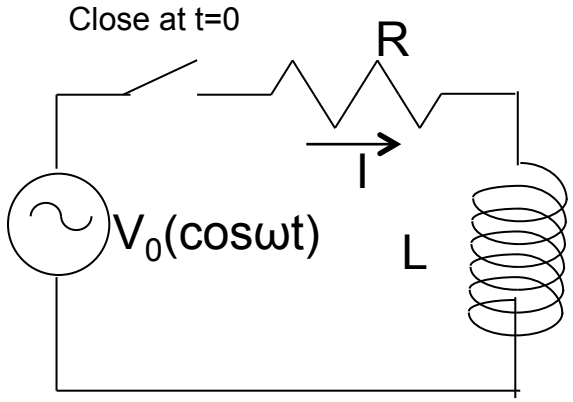
r1

If you drive this circuit with an AC source, $V = V_0\cos(\omega t)$, the resulting current is



$$I(t) = \frac{V_0}{\sqrt{L^2\omega^2 + R^2}}\cos(\omega t + \varphi) - \frac{V_0 R}{L^2\omega^2 + R^2}e^{-Rt/L}$$

with $\varphi = \tan^{-1}(-L\omega / R)$

Some questions to ponder

(Below, when I say "response", I generally mean "the amplitude of current")

i) What is the time constant for this circuit? What does it tell you physically? How would you make it longer?

ii) How do you read off, from that formula, the "long term" response? (Can you describe it in words?)

iii) After a long time, how does the frequency of the response compare with the frequency of the source?

iv) After a long time, is the current "leading" or "lagging" the source voltage?

v) Which leads to a stronger response of this circuit after a long time:
low driver frequency, or *high* driver frequency?

vi) What other questions about this circuit might be interesting to ask?