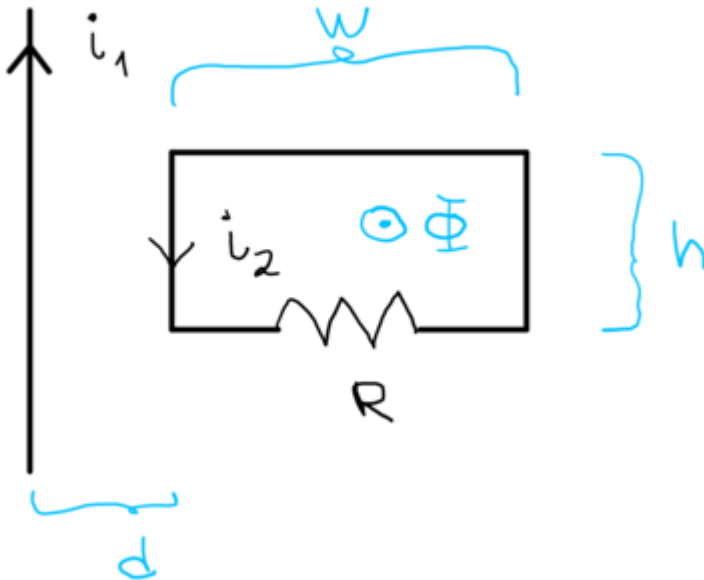# Problem set 07

Problem 1

A current pulse $i_1(t)$ passes through a long thin straight ideal conductor.

The pulse can be described using the Heaviside unit step function θ as

$$i_1(t) = I_1\,\theta(t)\theta(T - t),$$

where T is the length of the square pulse starting at $t = 0$. Assume the self-inductance of the square conductor to be L.

(a) Find the mutual inductance L_{12} and the induced current $i_2(t)$ in the square loop.

(b) If $T \gg L/R$ what is the energy dissipated in the resistor R?

(c) Through the use of graphics find the limiting form for the induced current $i_2(t)$ when the pulse in the straight conductor gets shorter and shorter and $T \ll L/R$. Please, scale the equation for $i_2(t)$ in order to use dimensionless quantities in the graphics.

The problem is due Monday March 03 2025 at 20:00