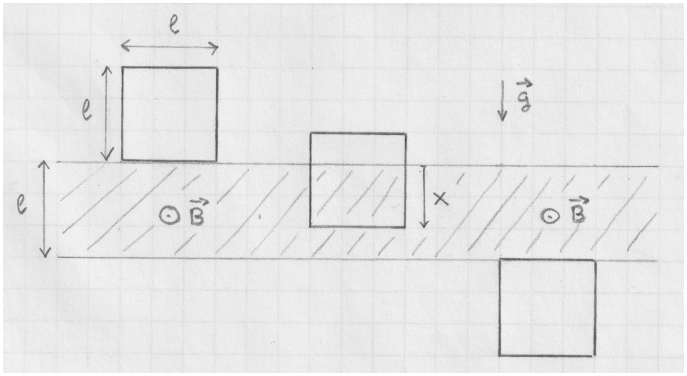
[lex76] Free fall attenuated by eddy currrent

A rectangular conducting frame of side l, mass m, and resistance R falls in a uniform gravitational field $\mathbf{g}$ through a strip of width l where a uniform magnetic field $\mathbf{B}$ is present. The frame is released from rest in the configuration on the left and we investigate the time interval until it reaches the configuration on the right.
(a) Calculate the velocity $v(t)$ of the frame as it falls through the strip. This can be accomplished by stating the equation of motion, $F = mdv/dt$, and solving it via separation of variables.
(b) Calculate the position $x(t)$ of the lower side of the frame relative to the upper edge of the strip by integration of the function $v(t)$.
(c) Take the limit $B \to 0$ in the results for $v(t)$ and $x(t)$ to recover familiar results for free fall in a uniform gravitational field.



Solution: