Some solutions for Homework 4

- 3.6: 12. In order to write down an ODE for this chain, consider both currents, i_1 and i_2, indicated in figure 3.37. By Kirchhoff's law we need to add up all the voltages around a loop. We choose two loops: the left one and the right one. Going around the left loop, we get

$$2i_1 + 5(i_1' - i_2') + 3i_1 = E(t).$$

Note that there are two currents flowing through $5H$: the current i_1 in the clockwise direction (thus the sign is positive), and i_2 in the anti-clockwise direction (the sign is negative). The equation for the other loop is this:

$$10i_2 + 4i_2 + 5(i_2' - i_1') = 0.$$

It is zero because there is no source in that loop. Again, through $5H$ we have the current i_2 in the clockwise direction and i_1 in the anti-clockwise direction. Once you have this system, you can solve it in the usual way by taking the Laplace transform.