## 0.1 Deriving FDTD method for one dimension

After unfurling the curl operations we get to the following system of six equations

$$\partial_y E_z - \partial_z E_y = -\mu \partial_t H_x \tag{1}$$
$$\partial_z E_x - \partial_x E_z = -\mu \partial_t H_y \tag{2}$$
$$\partial_x E_y - \partial_y E_x = -\mu \partial_t H_z \tag{3}$$
$$\partial_y H_z - \partial_z H_y = \varepsilon \partial_t E_x + \sigma E_x \tag{4}$$
$$\partial_z H_x - \partial_x H_z = \varepsilon \partial_t E_y + \sigma E_y \tag{5}$$
$$\partial_x H_y - \partial_y H_x = \varepsilon \partial_t E_z + \sigma E_z \tag{6}$$

that will function as basis for any of the following discretizations. Note that $\partial_x$ is a shorthand for the partial derivation operator $\frac{\partial}{\partial x}$.

## 0.2 Simulations