

The advection equation is

$$\partial_t q(x, t) + c(x) \partial_x q(x, t) = 0,$$

where $q(x, t)$ is the scalar quantity to be advected and $c(x)$ is the advection velocity. Write down the weak form of this equation and perform integration by parts. What happens to the anti-derivative? Does it cancel out at the boundaries as in the 1D elastic wave equation? Note: This is the point of departure for the discontinuous Galerkin method.