Time dependence

It can then be shown that the Bloch spectrum and Dirichlet spectrum are independent of time if $q(x,t)$ evolves according the the KdV equation.

The behavior at infinity is then

$$\psi_{\pm}(x,t;\lambda) = \mathrm{e}^{\pm \mathrm{i}(x-x_0)\sqrt{\lambda} \pm 4\mathrm{i}t\,\lambda^{3/2}}(1+o(1)).$$

This is enough information to set up a RH problem for $\psi_{\pm}(x,t;\lambda)$.

An example