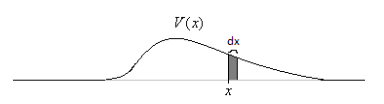
**1D Evolution equations for t, r, tʹ, rʹ**

We can actually solve any 1D problem using a procedure called invariant embedding. We basically write down a differential equation for the transmission/reflection coefficients. Consider the coefficients for the potential up to x, and then also the extra piece between (x,x+dx).



The composition laws obtained from the transfer matrix formalism say that:



We can model the thin slice potential as a delta function with the strength V(z)dz. Then to first order the transmission/reflection coefficients will be:



Filling these in, we get the following. Note that the last is independent, I think it’s a complex Ricatti equation. It cannot be explicitly solved.



The transmission probability itself can be written as:



Hmmm.