

7.2 ONE DIMENSION

$$G = -\frac{i}{2k} e^{i k |y|}$$

$$\psi(x) = \psi_0(x) - \frac{i m}{k} \int dx' e^{i k |x-x'|} V(x') \psi(x')$$

$$V(x') = u \delta(x')$$

$$= \psi_0(x) - \frac{i m u}{k} e^{i k |x|} \psi(0)$$

$$\psi_0 = e^{i k x}$$

$$\frac{u m}{k} \equiv Z$$

$$\psi(0) = 1 - i Z \psi(0)$$

$$\psi(0) = \frac{1}{1 + i Z}$$

$$e^{i k x} \begin{cases} e^{i k x} & x > 0 \\ e^{-i k x} & x < 0 \end{cases}$$

$$\psi(x) = \psi_0(x) - \frac{i Z}{1 + i Z} e^{i k |x|}$$

$$= \begin{cases} e^{i k x} + R e^{-i k x} & x < 0 \\ e^{i k x} (1 + R) & x > 0 \end{cases}$$

where

$$R = \frac{-i Z}{1 + i Z}$$

REFLECTION COEFF.

BORN APPROXIMATION IS 1ST ORDER
IN u , i.e. 1ST ORDER IN Z

$$\left(\psi(x) \approx \psi(0) - iZ e^{i\kappa|x|} \psi(0) = e^{i\kappa x} - iZ e^{i\kappa|x|} \right)$$

$$\psi(x) \approx \psi_0(x) - iZ e^{i\kappa|x|}$$

$$Z = \frac{\mu m}{\kappa} \ll 1$$

NOT VALID FOR LOW ENOUGH ENERGIES