Summary of Lecture 6

- JWKB approximation

$$\psi(x) \sim \frac{1}{\sqrt{k(x)}} e^{\pm i \int^x k(x')dx'} \qquad k(x) = \sqrt{2m[E - V(x)]}/\hbar$$

valid for $\frac{dk}{dx} \ll k^2 \qquad \hbar \frac{dp}{dx} \ll p^2$

- Connection formulae arise from evaluating

$$f(z) = \frac{1}{2\pi} \int_{\text{contour}} e^{ikz + ik^3/3} dk$$

in the stationary phase approximation, valid for $z \to \pm\infty$

This Lecture (7)

- Scattering Theory

Summary of Lecture 7

- 1D scattering from symmetric potential

$$\Psi_k(x) = c_{\mathrm{even}} \cos(k|x| + \delta_{\mathrm{even}}) + c_{\mathrm{odd}} \operatorname{sgn}(x) \cos(k|x| + \delta_{\mathrm{odd}})$$

- Lippmann-Schwinger Equation

$$\Psi_k(x) = \exp\left(\mathrm{i}kx\right) + \int \mathrm{d}x' \, G_k^+(x, x') V(x') \Psi_k(x')$$

- Scattering in 3D

$$\Psi_k(\vec{r}) \underset{r \to \infty}{\longrightarrow} \exp\left(\mathrm{i}kz\right) + \frac{f(\theta, \phi)}{r} \exp\left(\mathrm{i}kr\right)$$

Differential cross section $\quad \dfrac{d\sigma}{d\Omega} = |f(\theta, \phi)|^2$

Next Lecture (8)

- First Born Approximation
- Partial Wave Analysis
- Optical Theorem