

Recitation #8
Quantum 521

1. A neutron travels from A to D along two paths up the tilted plane shown in Figure 1. Calculate the phase difference of the wave function along the two paths in terms of the neutron mass m , the gravitational acceleration g , and the de Broglie wavelength λ , the angle δ , and other constants. Calculate the interference probability resulting from the interference.

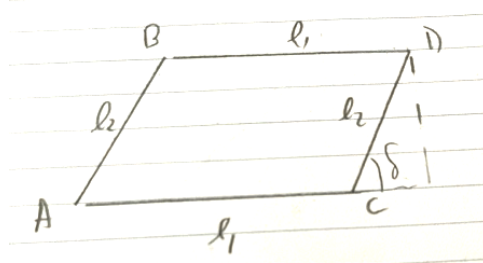


Figure 1: Plane is rotated around axis AC by an angle δ so that it is tilted vertically. The neutron climbs the hill of height $l_2 \sin \delta$ going from A to D.

2. Write the propagator for the free particle as an expansion in energy eigenstates, and then calculate the propagator $\langle x_1, t | x_0, 0 \rangle$. Use the “complete the square” Gaussian integral,

$$\int_{-\infty}^{+\infty} \exp(-ax^2 + bx) = \sqrt{\frac{\pi}{a}} \exp\left(\frac{b^2}{4a}\right)$$