PHY 711 – Assignment #2

08/29/2014

1. In evaluating the differential cross section for Rutherford scattering, it is necessary to evaluate the following relationship involving the scattering angle θ, the impact parameter b, and a length parameter κ which involves the ratio of the interaction strength to the system energy:

$$\frac{\pi}{2} - \frac{\theta}{2} = \int_{\kappa+\sqrt{\kappa^2+b^2}}^{\infty} \frac{b}{r} \frac{1}{\sqrt{r^2 - 2\kappa r - b^2}} dr.$$

   Use Maple or other algebraic manipulation software to evaluate the integral to show that

$$2b = \frac{\kappa}{\tan(\theta/2)}.$$

2. From this form of the impact parameter $b(\theta)$, "derive" the Rutherford scattering cross section.