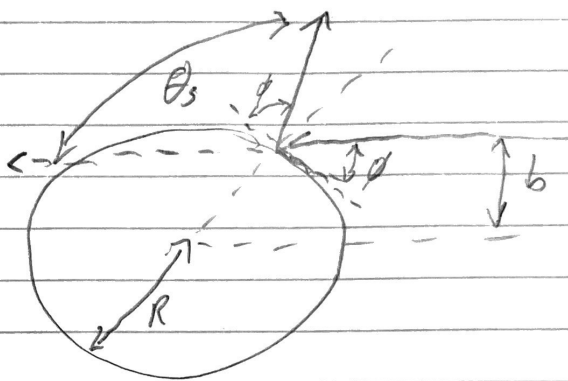


A point particle is fired at a spherical target of radius R . The particle bounces off the target elastically with scattering angle θ_s .

Find the differential cross section

$$\frac{d\sigma}{d\cos\theta_s}$$



An angle θ from the center of the target to the point of contact bisects the trajectory

impact param is then $b = R \sin\theta$
 scattering angle is $\theta_s = \pi - 2\theta$
 differential cross section

$$d\sigma = 2\pi b db$$

$$= 2\pi R^2 \sin\theta \cos\theta d\theta$$

$$= \pi R^2 \sin(2\theta) d\theta = \pi R^2 \sin(\pi - \theta_s) = \pi R^2 \sin\theta_s d\theta$$

$$= \frac{\pi R^2}{2} \sin\theta_s d\theta_s = \frac{\pi R^2}{2} d\cos\theta_s$$

$$\frac{d\sigma}{d\cos\theta_s} = \frac{\pi R^2}{2}$$