J03M.1

Solution to J03M.1 — Scattering from an Attractive Potential

1. With the conservation of Energy and Horizontal Momentum, we have

$$E = E' - V_0 \tag{1}$$

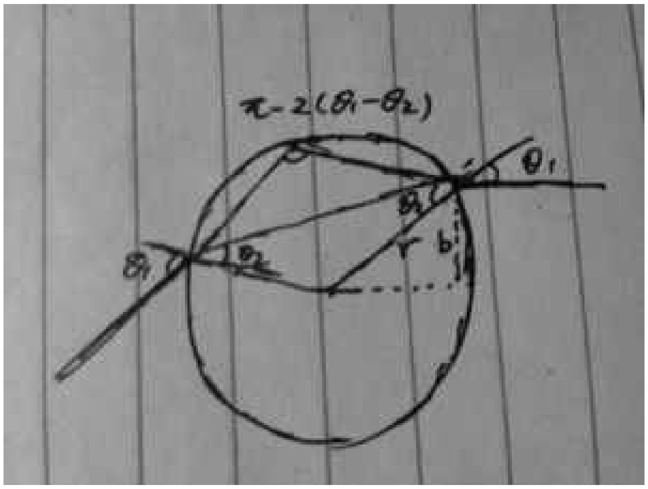
$$2mE\sin\theta_1 = 2mE'\sin\theta_2 \tag{2}$$

And since we are considering an attractive force, we always require $V_0 > 0$

Thus we can easily get the θ_2 as

$$\theta_2 = \sin^{-1}(\frac{E}{E+V_0}\sin\theta_1) \tag{3}$$

2. With the geometry given below, we see



$$b = r\sin\theta_1 \tag{4}$$

Which gives the relation between θ, b, with $n = \frac{E}{E+V_0}$

$$b = \frac{\sin\frac{\theta}{2})}{\sqrt{1+n^2-2n\cos\frac{\theta}{2}}} \tag{5}$$

Which in the end gives

$$\frac{d\sigma}{d\Omega} = \frac{b}{\sin\theta}\frac{db}{d\theta} = \frac{1}{4\sqrt{1+n^2-2n\cos\frac{\theta}{2}}} - \frac{n\sin^2\frac{\theta}{2}}{\sin\theta(1+n^2-2n\cos\frac{\theta}{2})^{3/2}} \tag{6}$$

One thought on "J03M.1"

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Notice that in (2) your expression for momentum is wrong.