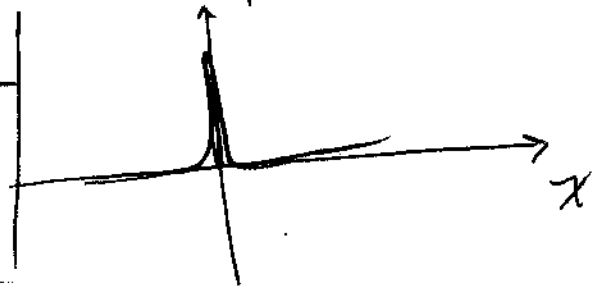
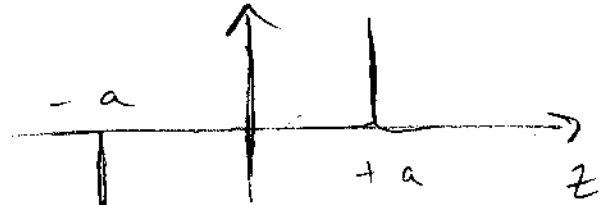
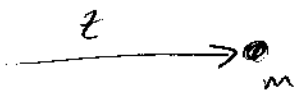


Problem #2 Fall 2003

$$\delta(x) \delta(y) \delta(z-a)$$

$$V = V_0 \left[\delta(\vec{r} - a\hat{z}) - \delta(\vec{r} + a\hat{z}) \right]$$



$$\frac{d\sigma}{d\Omega} = |f(\theta, \phi)|^2$$

$$\frac{d\sigma}{d\Omega} = \frac{\mu^2}{4\pi^2 \hbar^4} \left| \int e^{i\vec{q} \cdot \vec{r}'} V(\vec{r}') d^3r' \right|^2$$

$$f(\theta, \phi) = V_0 \int e^{i\vec{q} \cdot \vec{r}'} \left(\delta(\vec{r} - a\hat{z}) - \delta(\vec{r} + a\hat{z}) \right) d^3r'$$

$$= V_0 \left(e^{i\vec{q} \cdot a\hat{z}} - e^{-i\vec{q} \cdot a\hat{z}} \right) = V_0 2 \sin(\vec{q} \cdot a\hat{z})$$

$$= V_0 2 \sin\left(2k \sin^2(\theta/2)\right)$$

$$q_z = q \sin(\theta/2)$$

$$q = 2k \sin(\theta/2)$$

$$\frac{d\sigma}{d\Omega} = \frac{M^2 V_0^2}{\pi^2 \hbar^4} \sin^2\left(2k \sin^2(\theta/2)\right)$$