13. According to Newton’s second law, the magnitude of the force is given by \( F = ma \), where \( a \) is the magnitude of the acceleration of the neutron. We use kinematics (Table 2-1) to find the acceleration that brings the neutron to rest in a distance \( d \). Assuming the acceleration is constant, then \( v^2 = v_0^2 + 2ad \) produces the value of \( a \):

\[
a = \frac{(v^2 - v_0^2)}{2d} = \frac{-(1.4 \times 10^7 \text{ m/s})^2}{2(1.0 \times 10^{-14} \text{ m})} = -9.8 \times 10^{27} \text{ m/s}^2.
\]

The magnitude of the force is consequently

\[
F = m|a| = (1.67 \times 10^{-27} \text{ kg})(9.8 \times 10^{27} \text{ m/s}^2) = 16 \text{ N}.
\]