36. We use Eq. 8-20 and various observations made in §8-5.

(a) The force at $x = 2.0$ m is

$$F = -\frac{dU}{dx} \approx -\frac{(-17.5) - (-2.8)}{4.0 - 1.0} = 4.9 \text{ N}$$

in the $+x$ direction (but there is some uncertainty in reading the graph which makes the last digit not very significant).

(b) The total mechanical energy at $x = 2.0$ m is

$$E = \frac{1}{2}mv^2 + U \approx \frac{1}{2}(2.0)(-1.5)^2 - 7.7 = -5.5$$

in SI units (Joules). Again, there is some uncertainty in reading the graph which makes the last digit not very significant. At that level ($-5.5$ J) on the graph, we find two points where the potential energy curve has that value – at $x \approx 1.5$ m and $x \approx 13.5$ m. Therefore, the particle remains in the region $1.5 < x < 13.5$ m.

(c) At $x = 7.0$ m, we read $U \approx -17.5$ J. Thus, if its total energy (calculated in the previous part) is $E \approx -5.5$ J, then we find

$$\frac{1}{2}mv^2 = E - U \approx 12\,\text{J} \implies v = \sqrt{\frac{2}{m}(E - U)} \approx 3.5 \text{ m/s}$$

where there is certainly room for disagreement on that last digit for the reasons cited above.