2. We are given the force and the time through which the force acts, so we can determine the impulse.

$$\text{Impulse} = F \, \Delta t$$

$$\text{Impulse} = (500 \text{ N})(0.001 \text{ s}) = 0.5 \text{ N s}$$

The impulse / momentum theorem tell us that the impulse is equal to the change in momentum, so we now know that the change in the momentum was 0.5 N s or

$$\Delta p = 0.5 \text{ N s}$$

The definition of the change of momentum is the difference between the final momentum and the initial momentum or

$$\Delta \mathbf{p} = m \mathbf{v_f} - m \mathbf{v_i}$$

where $\mathbf{v_f}$ is the final velocity and $\mathbf{v_i}$ is the initial velocity. This is a one-dimensional problem, so the calculation becomes a scalar calculation instead of a vector calculation. Also, we know that initially the object was at rest or $v_i = 0$. Thus we have

$$\Delta p = m v_f - m (0)$$

We solved for the change in momentum above, so we have

$$0.5 \text{ N s} = m v_f - 0$$

The mass was given as $m = 0.20$ kg, so we get

$$0.5 \text{ N s} = (0.20 \text{ kg}) v_f$$

Therefore

$$v_f = 2.5 \text{ N s /kg} = 2.5 \text{ (kg m / s}^2\text{)(s) / kg}$$

$$v_f = 2.5 \text{ m / s}$$