11. We take the magnitude of the force to be $F = At$, where $A$ is a constant of proportionality. The condition that $F = 50\,\text{N}$ when $t = 4.0\,\text{s}$ leads to $A = (50\,\text{N})/(4.0\,\text{s}) = 12.5\,\text{N/s}$. The magnitude of the impulse exerted on the object is

$$J = \int_0^{4.0} F\,dt = \int_0^{4.0} At\,dt = \frac{1}{2}At^2\bigg|_0^{4.0} = \frac{1}{2}(12.5)(4.0)^2 = 100\ \text{N}{\cdot}\text{s}\ .$$

This equals the magnitude of the change in the momentum of the object (by the impulse-momentum theorem), and since the ball started from rest, we have $J = mv_f$. Therefore, $v_f = J/m = (100\,\text{N}\cdot\text{s})/(10\,\text{kg}) = 10\,\text{m/s}$.