$$\begin{cases} y(t) = -\dfrac{gt^2}{2} + v_0 t = h_0 \qquad \rightarrow \qquad t = \dfrac{v_0 \pm \sqrt{v_0^2 - 2gh_0}}{g} \\[2ex] y(t+\Delta t) = -\dfrac{g(t+\Delta t)^2}{2} + v_0(t+\Delta t) = h_0 \end{cases}$$

$$y(t+\Delta t) - y(t) = 0$$

$$-\frac{g}{2}\left(2t\Delta t + \Delta t^2\right) + v_0\Delta t = 0$$

$$-gt\Delta t - \frac{g\Delta t^2}{2} + v_0\Delta t = 0$$

$$-g\frac{v_0 \pm \sqrt{v_0^2 - 2gh_0}}{g}\Delta t - \frac{g\Delta t^2}{2} + v_0\Delta t = 0$$

$$-v_0\Delta t \mp \sqrt{v_0^2 - 2gh_0}\,\Delta t - \frac{g\Delta t^2}{2} + v_0\Delta t = 0$$

$$\mp\sqrt{v_0^2 - 2gh_0}\,\Delta t = \frac{g\Delta t^2}{2}$$

$$\mp\sqrt{v_0^2 - 2gh_0} = \frac{g\Delta t}{2}$$

$$v_0^2 - 2gh_0 = \left(\frac{g\Delta t}{2}\right)^2$$

$$v_0 = \sqrt{\left(\frac{g\Delta t}{2}\right)^2 + 2gh_0} = \sqrt{\left(\frac{10\cdot 2}{2}\right)^2 + 2\cdot 10\cdot 15} = \sqrt{100+300} = 20\left[\frac{\mathrm{m}}{\mathrm{s}}\right]$$