Answer on Question #76291, Physics Mechanics Relativity

A ball is thrown vertically upward from the foot of a tower. It crosses the top of the tower twice after an interval of 4s and reaches the foot of the tower 8s after it was thrown what is the height of the tower?

Solution.

Height of the tower:

$$h = v_0 \cdot t - \frac{g \cdot t^2}{2}$$

$h = v_0 \cdot (t + \Delta t) - \frac{g \cdot (t+\Delta t)^2}{2}$,

where $\Delta t = 4s$

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

From here

$$t = \frac{v_0 - \frac{g \cdot \Delta t}{2}}{g}$$

At the top $v = v_0 - g\frac{T}{2}$,

Where T = 8s

$$0 = v_0 - 4g$$

$$v_0 = 40\ \frac{m}{s}$$

$$t = \frac{v_0 - \frac{g \cdot \Delta t}{2}}{g} = \frac{40 - \frac{10 \cdot 4}{2}}{10} = 2s$$

$$h = v_0 \cdot t - \frac{g \cdot t^2}{2} = 40 \cdot 2 - \frac{10 \cdot (2)^2}{2} = 60\ m$$

Answer: $h = 60\ m$