In a movie, a boy in a picnic spot at a cliff 100m high falls down. Just 2s after the incident, the movie hero with Superman like abilities lands at the cliff and takes a dive vertically downwards with initial speed u falling freely under gravity. What must be u so that the hero catches the boy just before boy reaches the ground? $\left[g = 10ms^{-2}, \sqrt{5} \approx 2.25 \right]$

Solution

Let t be the downward time of flight for the hero.

Then for the boy we have, $100 = \frac{1}{2} g(t+2)^2$

$\therefore t = 2(\sqrt{5} - 1) \approx 2.5s$

For the hero we have, $100 = ut + \frac{1}{2} gt^2 \approx 2.5u + 5 \times 2.5^2$

$\therefore 40 = u + 12.5$

$\therefore u = 27.5ms^{-1}$

Note that u is nearly 100 kmph which is not possible for a human.