Answer on Question #57393, Physics – Mechanics | Relativity

The distance from the pitcher's mound to home plate is 60 feet 6 inches (18.44 m). The fastest recorded pitch is 104.8 mph. If the pitch was thrown with a release angle of 0 degree relative to the horizontal, what's the vertical displacement of the ball between ball release on the mound and home plate? Assume the ball is released 18.44 m from home plate

Solution:

The initial horizontal velocity is

$$v_0 = 104.8 \, mph = 104.8 \cdot 0.44704 \, m/s = 46.85 \, m/s$$

The distance from mound (ball release point) and home plate is

$$d = 18.44 \, m$$

The time to traverse distance is

$$t = \frac{d}{v_0} = \frac{18.44}{46.85} = 0.3936 \, s$$

The vertical free-fall distance in 0.3936 s is

$$y = \frac{1}{2} g t^2 = (0.5)(9.81)(0.3936)^2 = 0.76 \, m$$

Answer: $0.76 \, m$