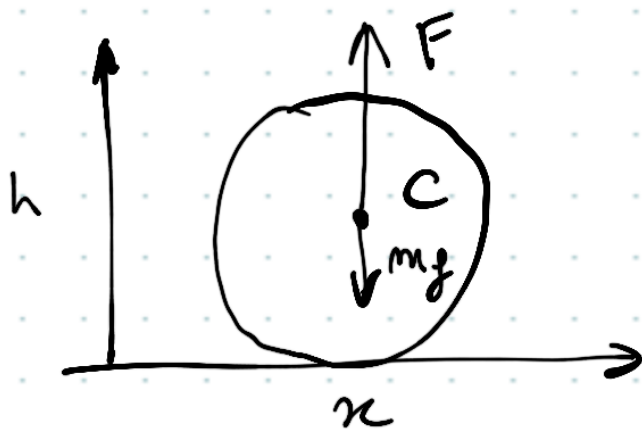


October 10, 2017.

BORIS LEISTEDT

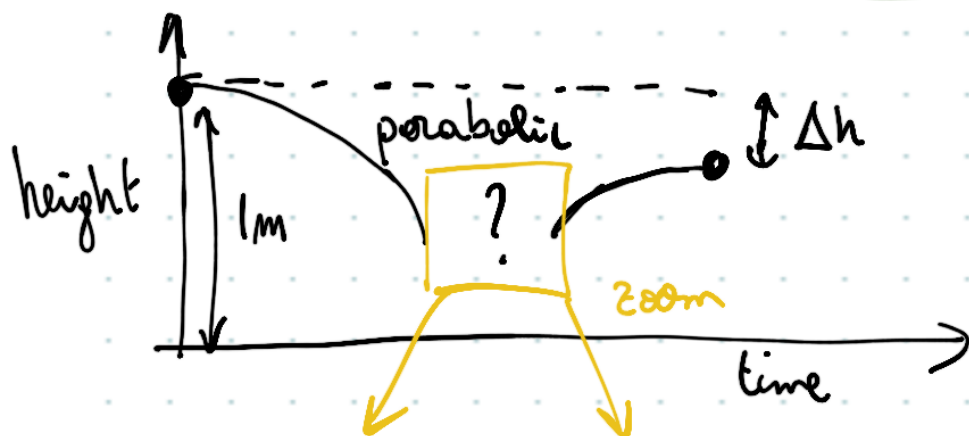
The BOUNCING BALL



Forces at impact.

all voted for $|mg| \leq |F| \leq 10|mg|$

let's roughly estimate F !

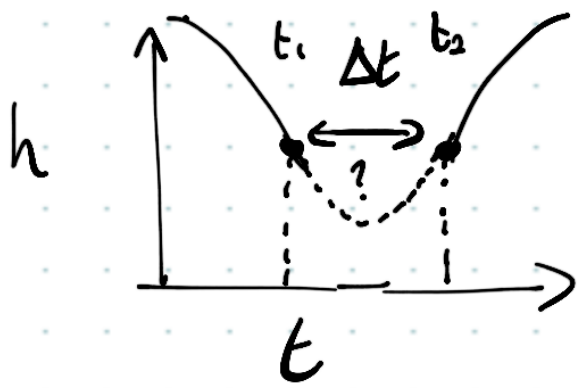


Δh due to energy loss
(vibrations, slipping, sound,
air resistance, etc)



not physical!
infinite velocities, forces, etc





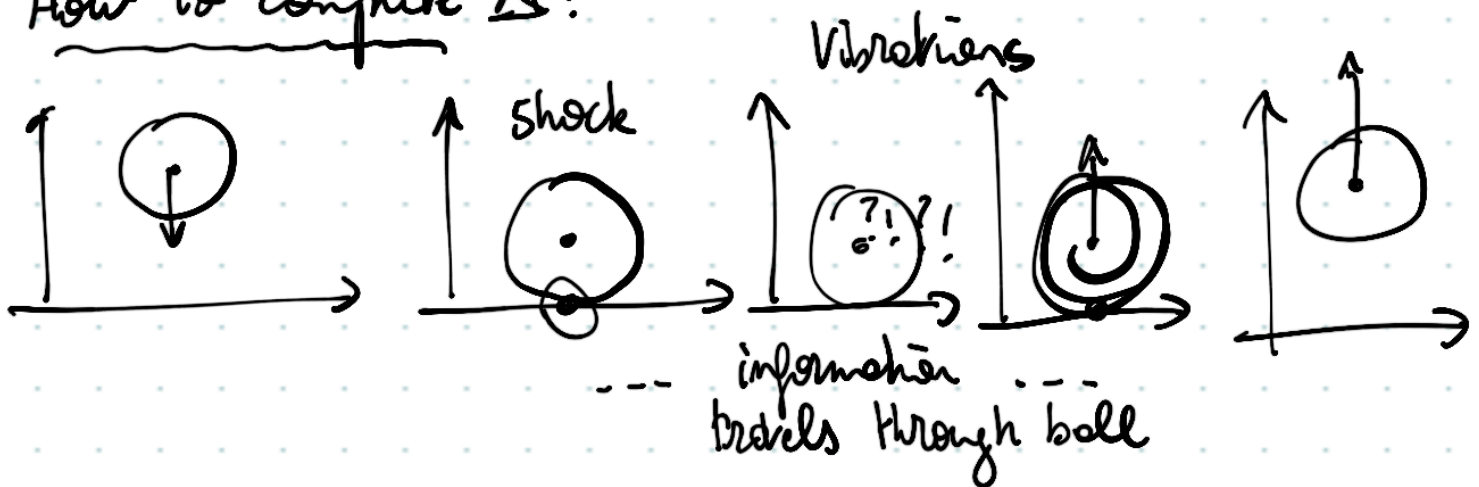
Rough calculation of F
 let's ignore the details of the shock.

$$v_1 = \sqrt{2hg} \approx 4 \text{ m/s}$$

$$v_2 = -v_1 \quad \text{Vertical velocity.}$$

$$h = 1 \text{ meter} \quad g = 9.81 \text{ m/s}^2$$

How to compute Δt ?



$$\begin{aligned} \Delta t &\approx \text{a few times diameter} / \text{speed of sand in ball} \\ &\approx \text{few cm} / \text{few km/s} \approx 10^{-6} \text{ sec} \\ &\approx 1 \mu\text{s} \end{aligned}$$

$$F = m \frac{\Delta v}{\Delta t} \approx 10^6 \text{ N} \approx 10^5 g$$

10,000 times larger than gravity! gravity can be neglected