

Source: [\[KBe2020math401fio2\]](#)

- Galileo's Inclined Plane
 - rolling a ball down the ramp
 - picture shows where the ball after each moment.
 - snapshots taken at constant rate
 - We can figure out the instantaneous speed
 - Equ is $y = 32x^2$
 - Derivative is $y = 32(x + d)^2 - 32x^2$
- "Instantaneous speed as a function"

$$\begin{aligned}
 y &= \frac{a(x+h)^2 - ax^2}{h} \\
 &= \frac{a(x^2 + h^2 + 2xh) - ax^2}{h} \\
 &= \frac{ax^2 + ah^2 + 2axh - ax^2}{h} \\
 &= \frac{\cancel{ax^2} + ah^2 + 2axh - \cancel{ax^2}}{h} \\
 &= \frac{ah^2 + 2axh}{h} \\
 &= \cancel{ah} + 2ax
 \end{aligned}$$
