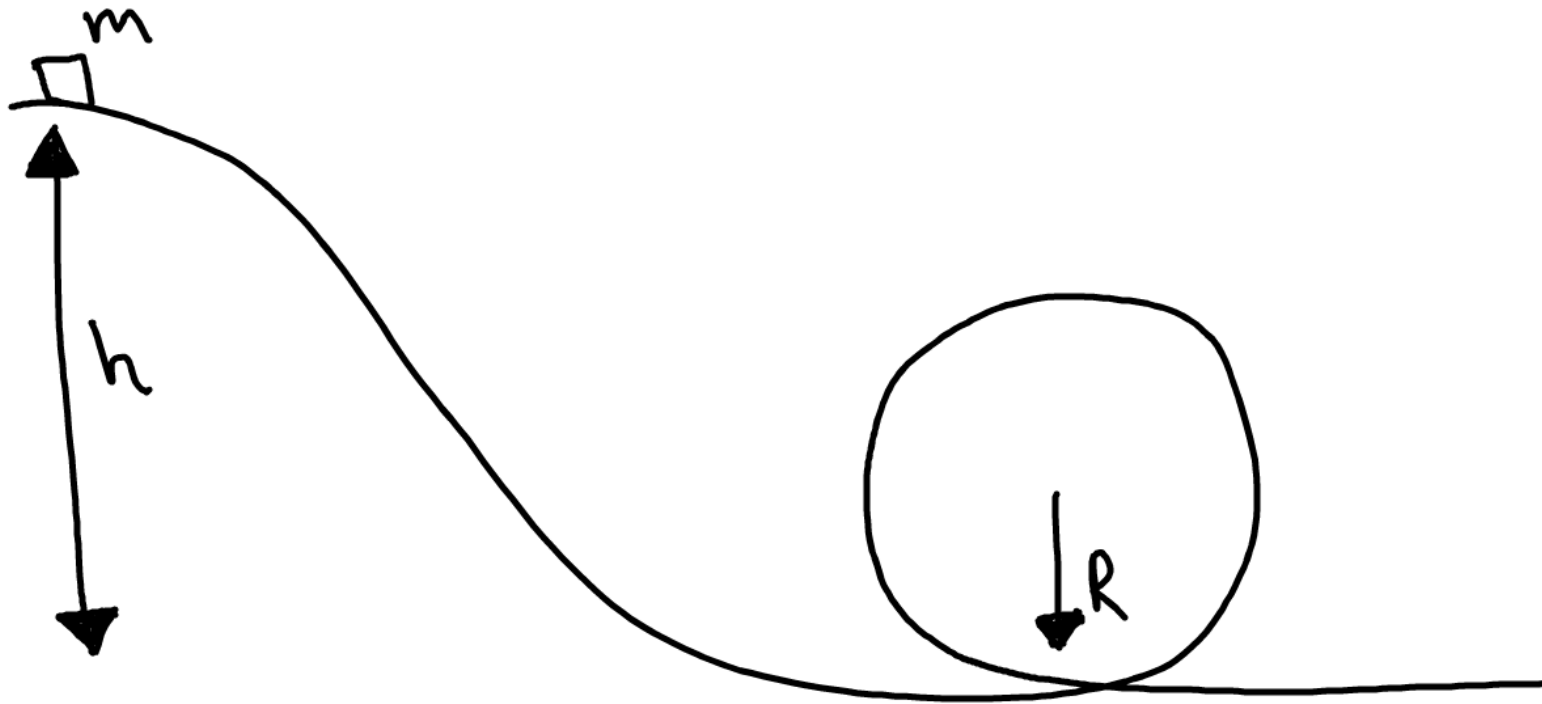
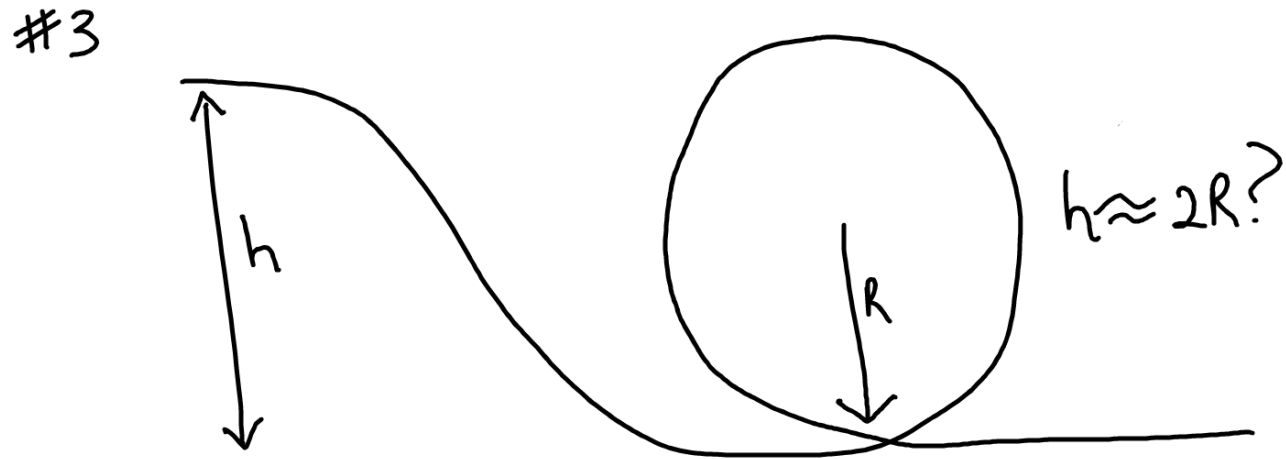
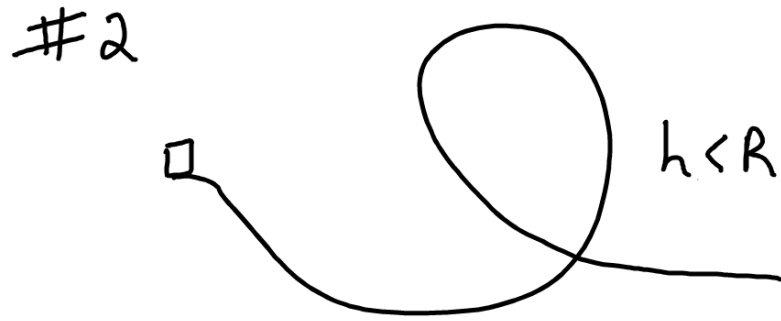
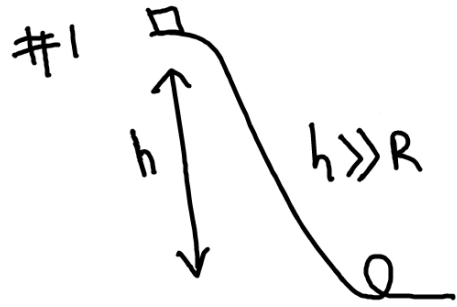


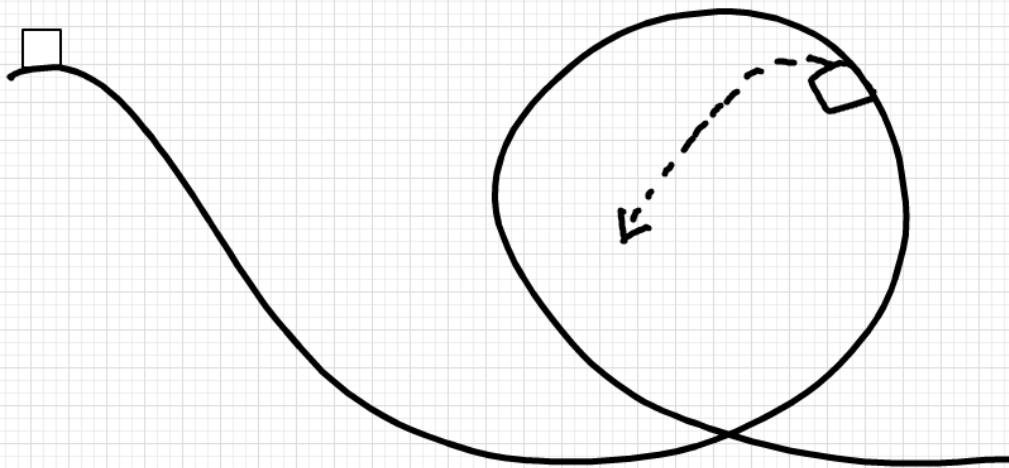
Problem 1: How high must the height of the hill be so that the block makes it safely around the loop-the-loop? Assume height of the hill is h , the block has a mass m and the radius of the loop is R . Find the minimum height?



- 1 - Newton's laws
- 2 - Circular motion
- 3 - Conservation of energy



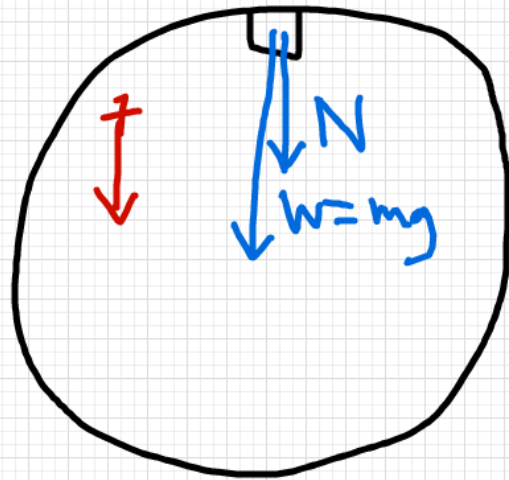
What happens if not enough speed?



We always
want contact
with track

⇒ we want
a Normal force

Free Body Diagram



$$\sum F = N + mg = ma$$

→ circular motion

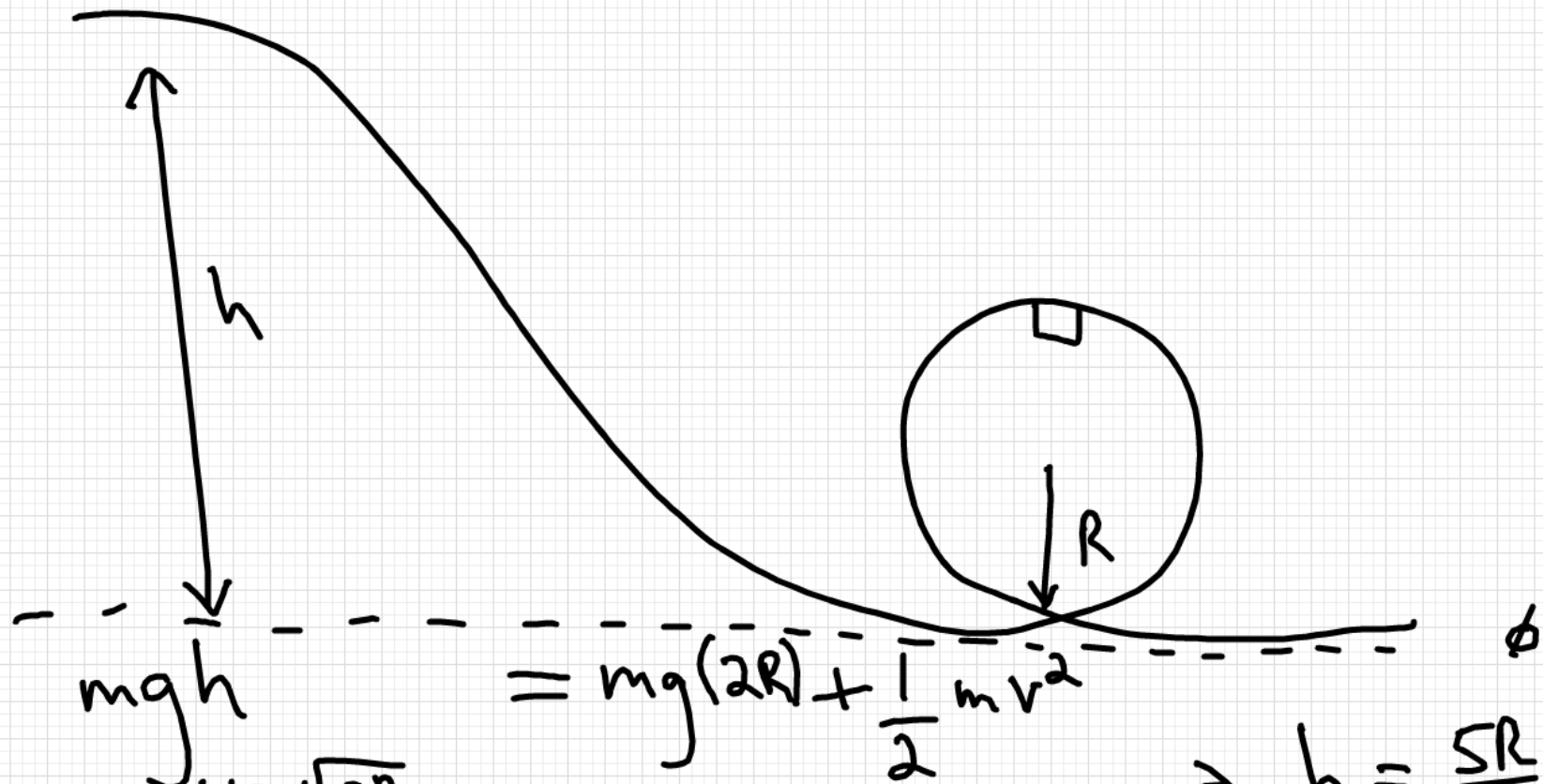
$$a_c = \frac{v^2}{R}$$

$$N + mg = \frac{mv^2}{R}$$



$$N = m \left(\frac{v^2}{R} - g \right)$$

$$N \neq 0 \quad v = \sqrt{gR}$$



$$mgh$$

$$= mg(2R) + \frac{1}{2}mv^2$$

$$mgh = \frac{1}{2}m(\sqrt{2gR})^2$$

$$= \frac{1}{2}m(2gR)$$

$$h = 2R + \frac{R}{2}$$

$$h = \frac{5R}{2}$$

ex: $R = 4m$

$$h = \frac{5 \cdot 4}{2} = 10m$$

