- What do you think is the world record for most number of free throws made in a row?
- Who do you think holds this record?

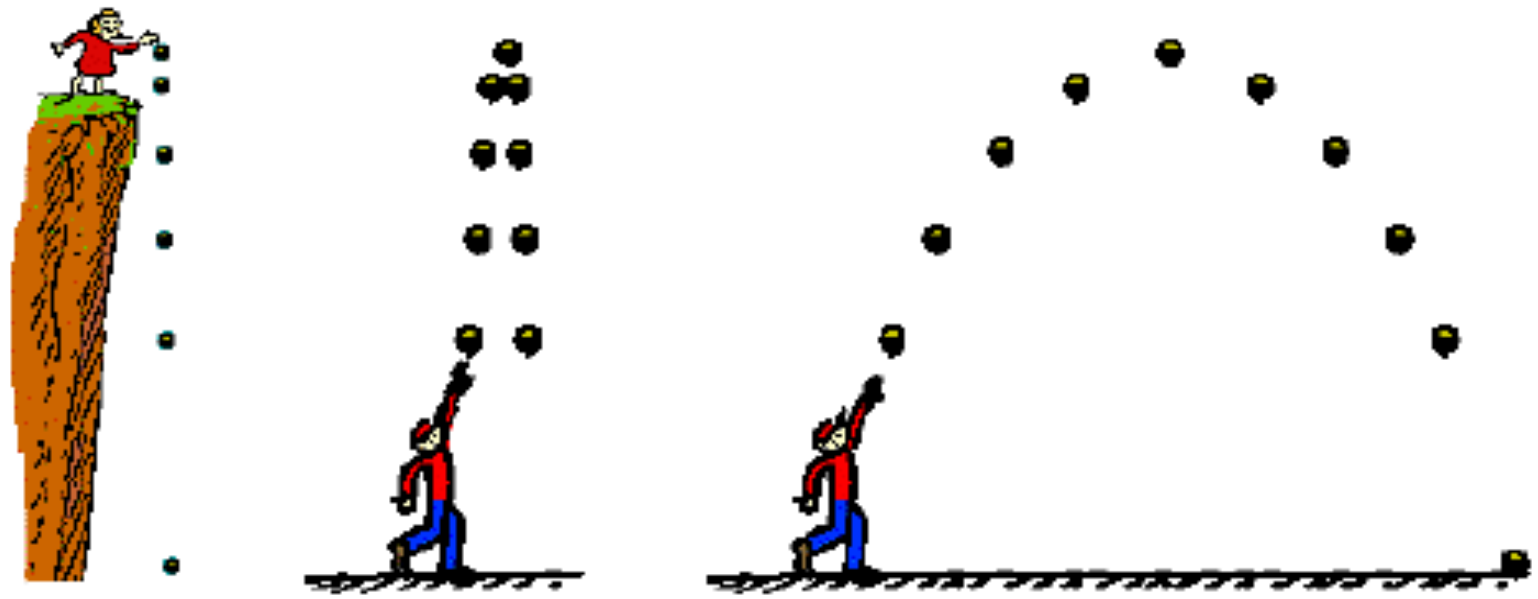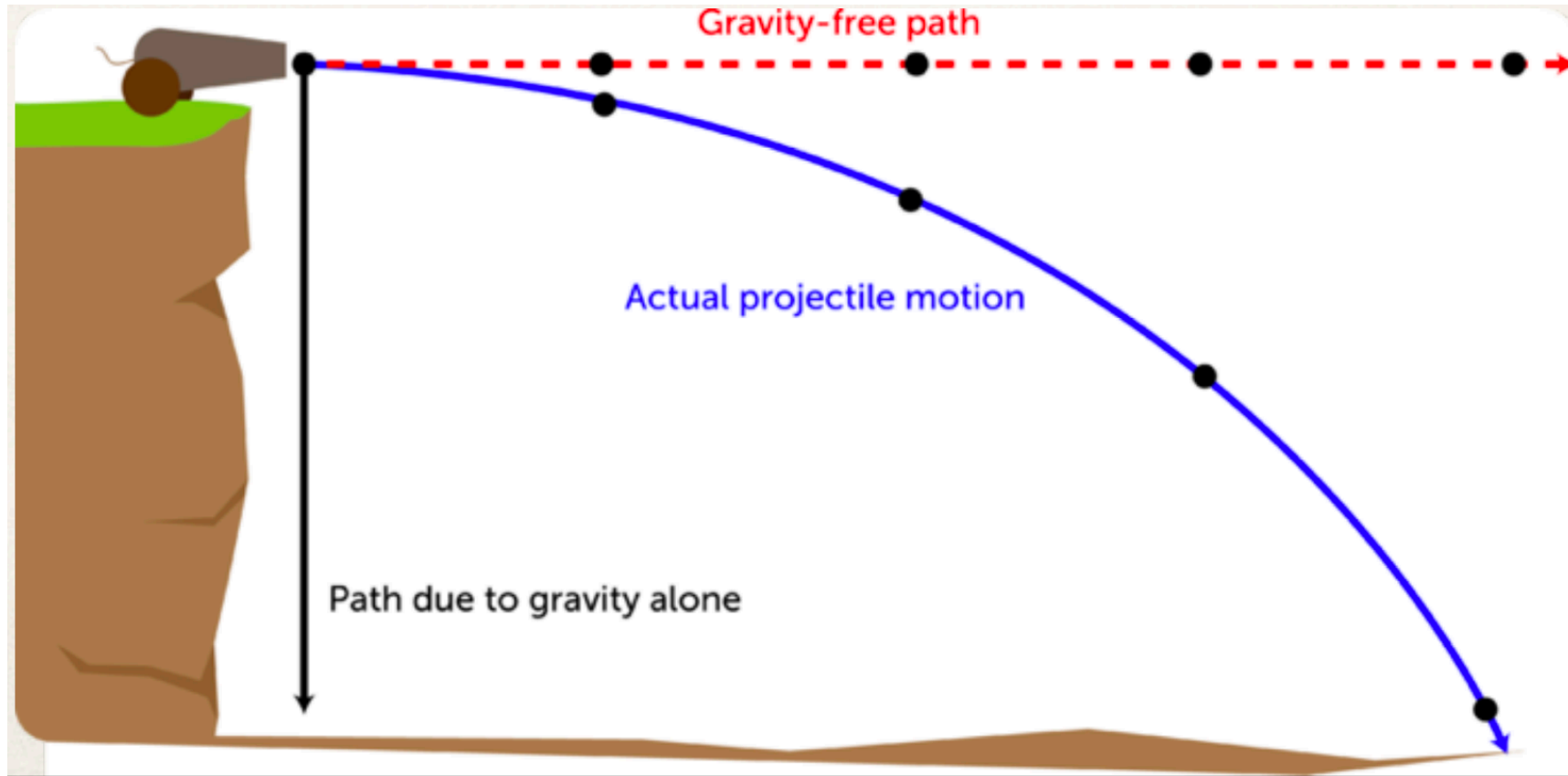- https://www.youtube.com/watch?v=dtvRN5S7m_U
- 5221!

Ted St. Martin
Free Throw World Record Holder

PROJECTILE MOTION

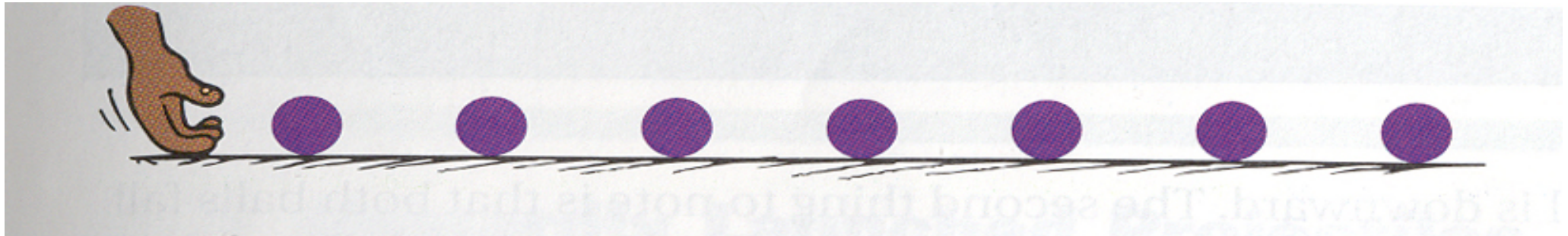- A **projectile** is any object that moves through space, **acted on only by gravity** once it is in the air.

Types of Projectiles

Projectiles near the surface of the earth follow a **curved path**, due to the force of gravity.

When no horizontal force acts on a projectile, the **horizontal component of the velocity is constant.**

- The horizontal and vertical components of a projectile are **completely independent of each other**

- An object projected horizontally will reach the ground at the **same time** as an object dropped vertically
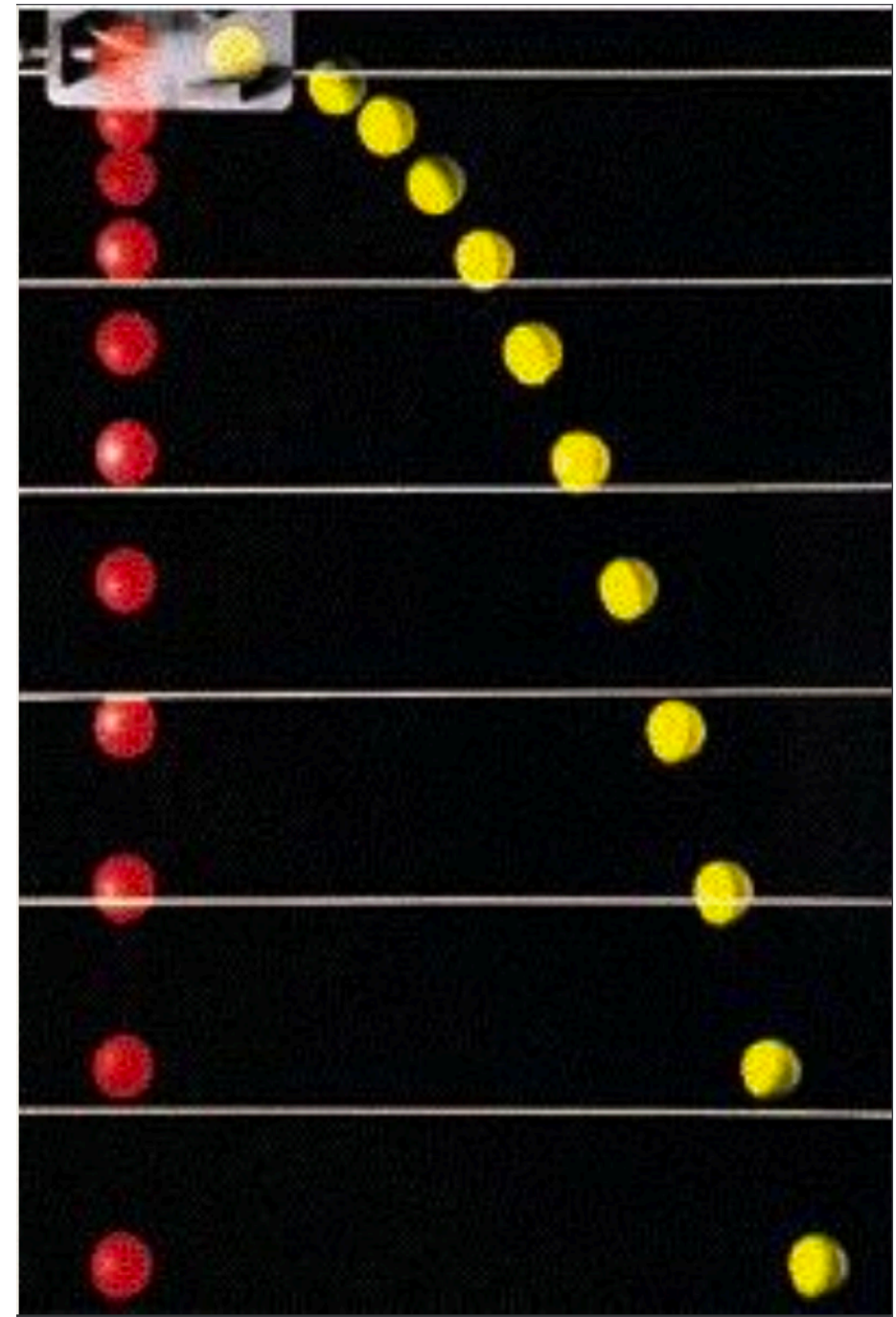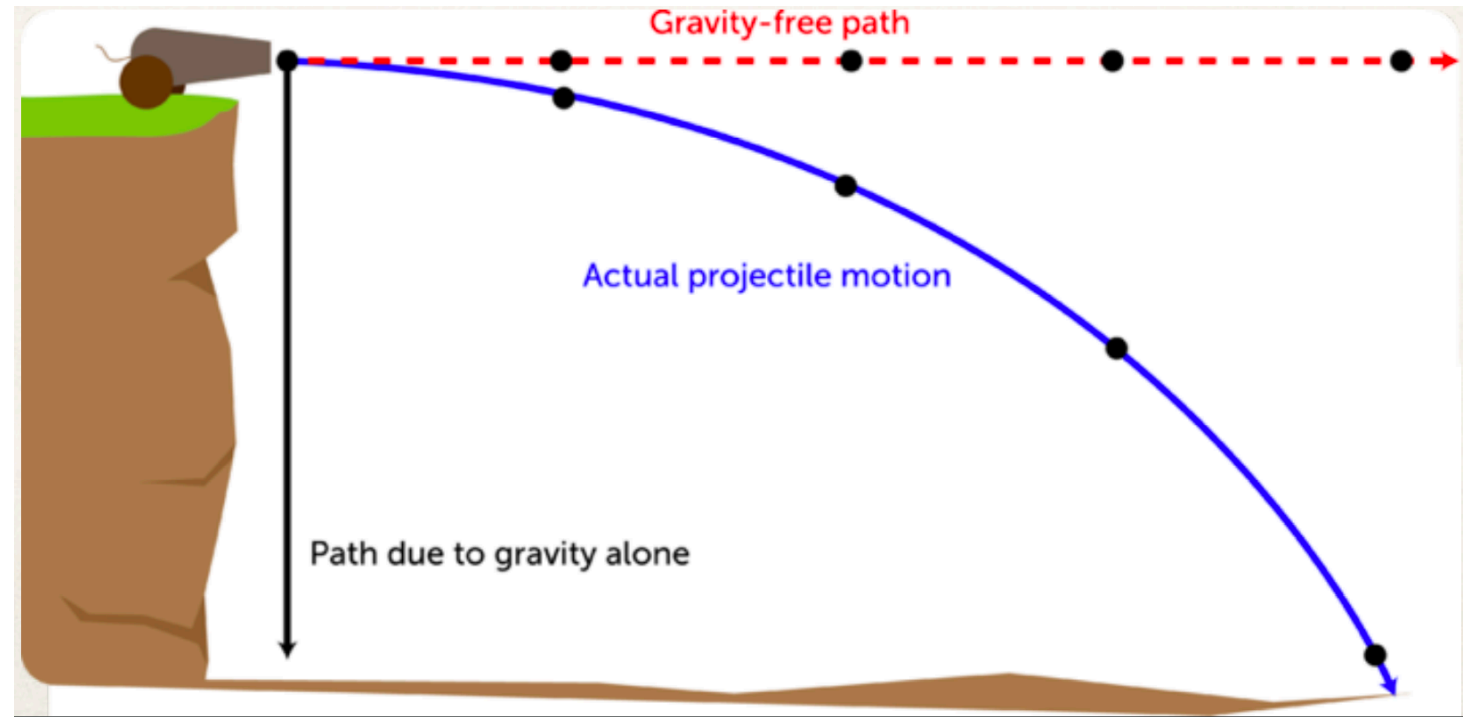
PROJECTILES

- The path traced by a projectile accelerating only in the vertical direction while moving at a constant horizontal velocity is a parabola.

CALCULATIONS FROM CLIFF

- "Find the time to hit the ground"
  - Time depends on height Δy and gravity
  - Given height Δy
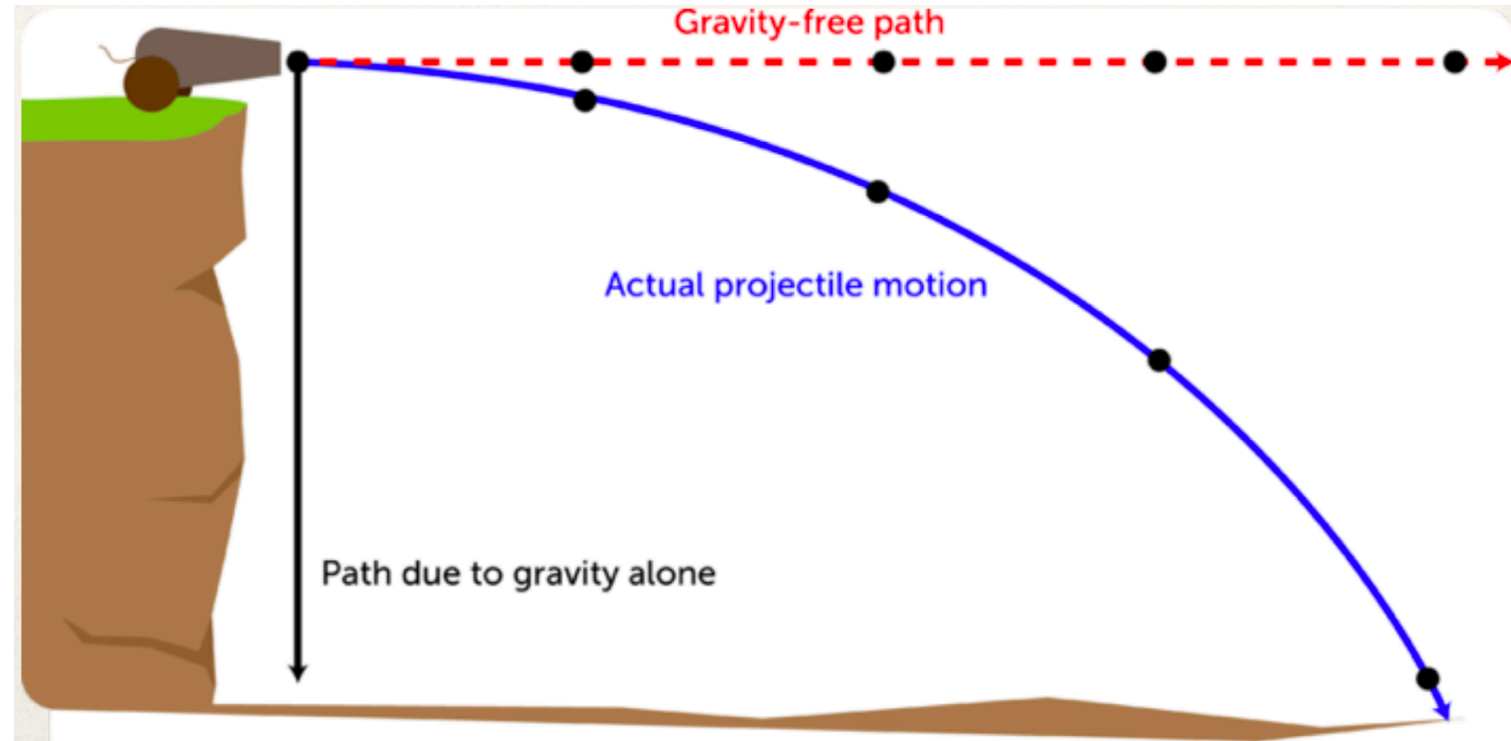 - Use $\Delta y = \frac{1}{2} a_y \Delta t^2$

Gravity-free path

Actual projectile motion

Path due to gravity alone

CALCULATIONS FROM CLIFF

- "Find the horizontal velocity"
  - Given time t to go horizontal distance x
  - No acceleration
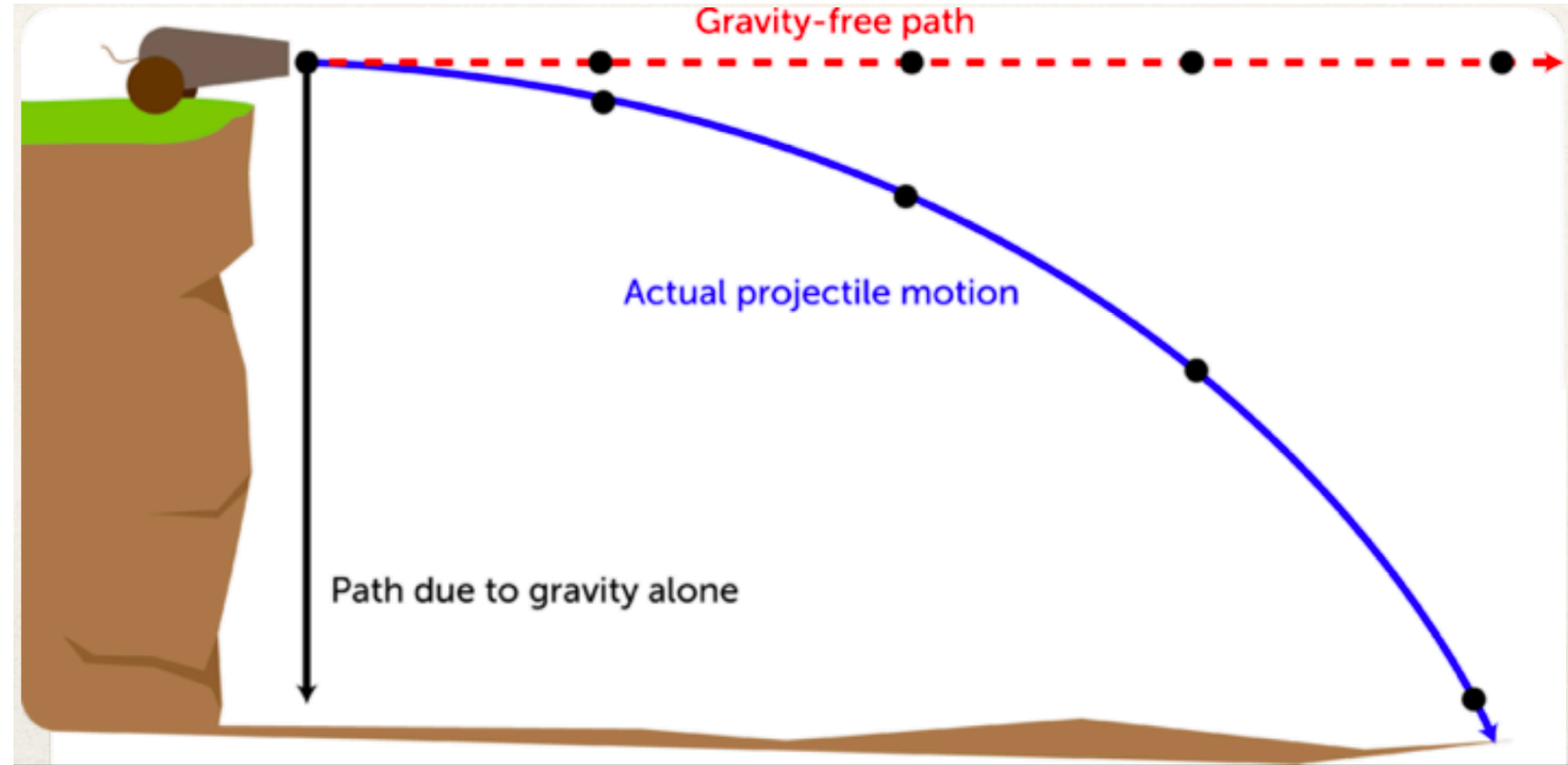 - $v_x = \dfrac{\Delta x}{\Delta t}$

Gravity-free path

Actual projectile motion

Path due to gravity alone

CALCULATIONS FROM CLIFF

- "Find the horizontal distance traveled from base of cliff" or "Find the range"

  - $v_x = \dfrac{\Delta x}{\Delta t}$

  - $\Delta x = v_x \Delta t$

Gravity-free path

Actual projectile motion

Path due to gravity alone

- **A plane flying at 3600 m up is traveling at 150 m/s. Vin Diesel puts a car in reverse so it leaves the back of the plane traveling at a horizontal -10. m/s.**
  - How long does it take for the car to hit the ground?
  - $\Delta y = \frac{1}{2} a_y \Delta t^2$
  - 27 seconds

- **A plane flying at 3600 m up is traveling at 150 m/s. Vin Diesel puts a car in reverse so it leaves the back of the plane traveling at a horizontal -10. m/s.**
  - What is the car's horizontal distance?
  - $v_x = \dfrac{\Delta x}{\Delta t}$
  - 3780 m

PHET PROJECTILE ACTIVITY

- Search "Phet projectile motion" on Google and the simulation is the first link

- Click "play" on the simulation

- Turn in the lab worksheet and "Vectors in-class activity" (guinea pig wkst) before you leave today