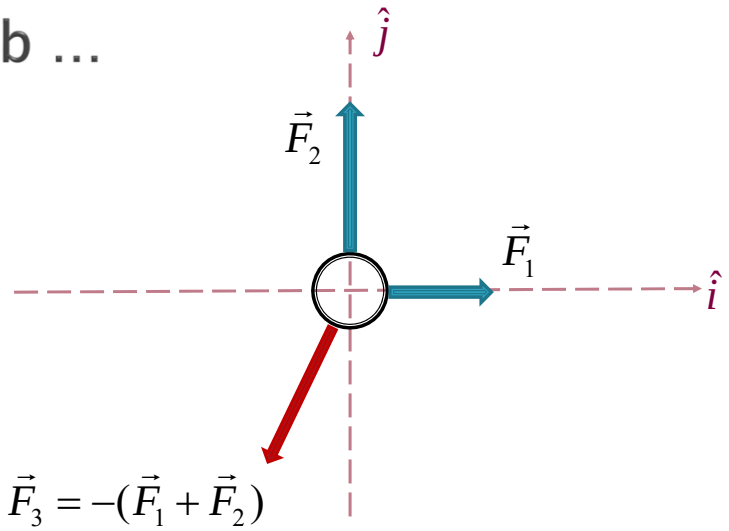
PHYS 210 - General Physics I

- Q&A session?
- 2-D motion
  - Projectiles
  - uniform circular motion

From Lab …



To express in terms of components with unit vector notation we need a coordinate system!

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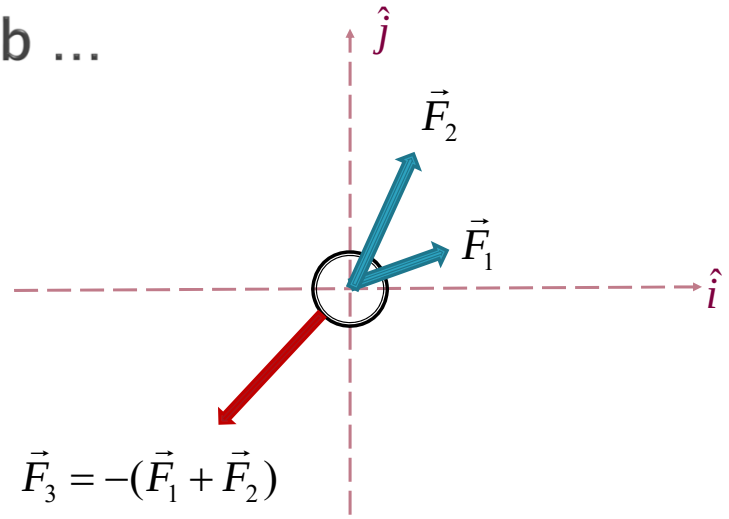

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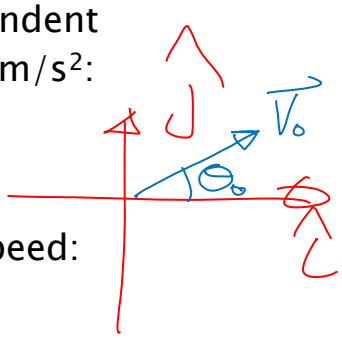
Pure vertical motion

Without air resistance – near Earth's surface!

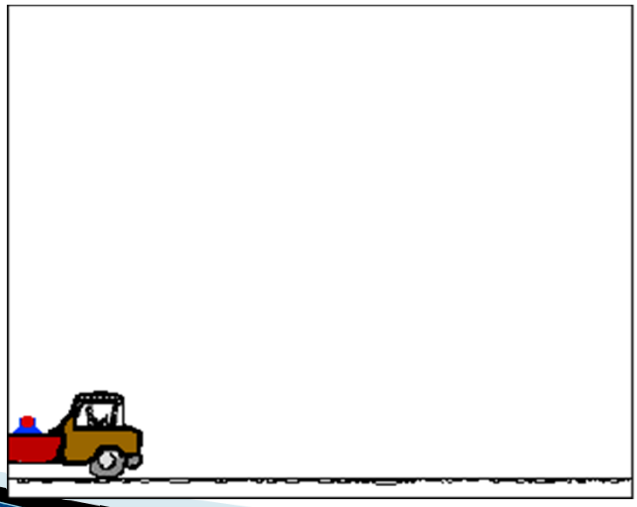
- Symmetries in time and speed:
  - Time up = time down
  - "Speed leaves hand = speed hits hand"
- Notation:
  - Use "y" for vertical displacements, "x" for horizontal ones
  - When add in horizontal motion, use subscripts to distinguish between horizontal and vertical variables

Motion in 2-D: Projectile Motion

- For now, ignore air resistance effects (trajectory is therefore parabolic)
- Vertical & horizontal motions independent
- Vertical motion is accelerated at 9.8 m/s^2:
  - $y - y_o = (v_o \sin \theta_o)\, t - \frac{1}{2} g t^2$
  - $v_y = v_o \sin \theta_o - g t$
  - $v_y^2 = (v_o \sin \theta_o)^2 - 2 g (y - y_o)$
- Horizontal motion is at a constant speed:
  - $x - x_o = (v_o \cos \theta_o)\, t$



Horizontal vs. vertical motion



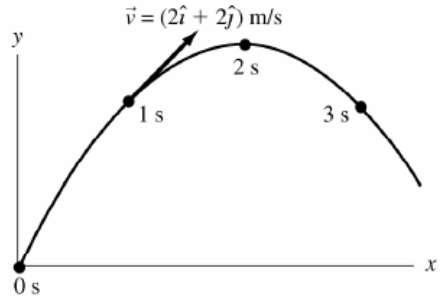
Horizontal vs. vertical motion

Q4.8

- An airplane flying horizontally at a constant speed of 350 km/hr over level ground releases a bundle of food supplies. Ignore the effect of air resistance. What are the bundle's initial (a) vertical and (b) horizontal components of velocity? (c) What is the horizontal component of the velocity just before hitting the ground?

Pair up!

A physics student on Planet Exidor throws a ball that follows the parabolic trajectory shown. The ball's position is shown at 1 second intervals until $t = 3$ s. At $t = 1$ s, the ball's velocity is $\vec{v} = (2\hat{\imath} + 2\hat{\jmath})$ m/s.



a. Determine the ball's velocity at $t = 0$ s, 2 s, and 3 s.
b. What is the value of g on Planet Exidor?

Make sure you all agree on and understand the answers!

Happy Wednesday!