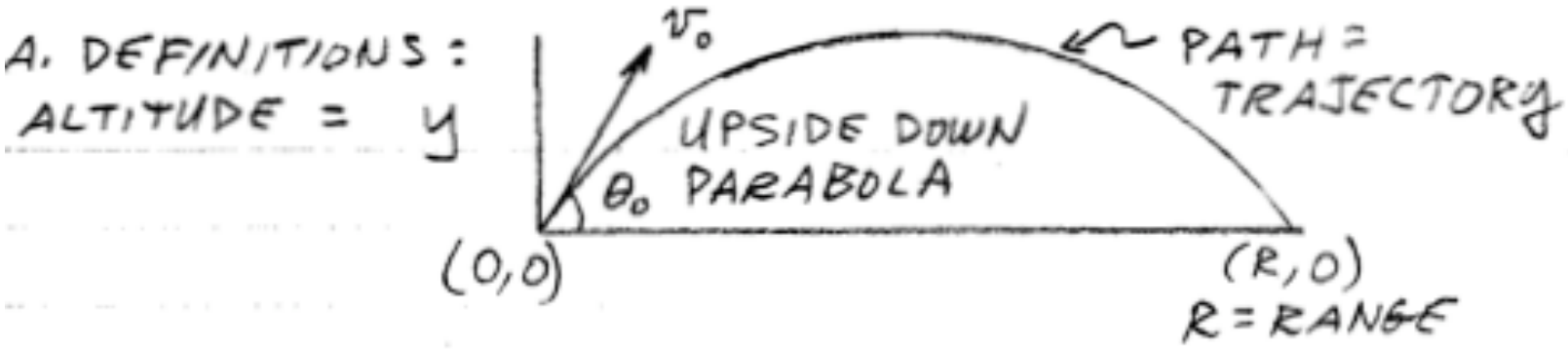
Projectile Motion

Two Dimensional Motion with Constant Acceleration

Definitions



- **Ex:** Baseball, cannonball, long jumper, etc.
- A projectile is any object experiencing freefall that is also traveling horizontally.

Keys:

- A projectile's velocity changes in the vertical direction but remains constant in the horizontal direction. (We ignore air resistance.)
- The time a projectile is in the air depends solely on quantities in the vertical direction and has nothing to do with the horizontal velocity.

Key: x and y motion are **independent!**

- Recipe:

1. Draw a diagram
2. Put the origin on the ground
3. Make an x and y chart. Include appropriate subscripts (i.e. v_{y0}, a_y, etc.)
4. Pick the appropriate equations and solve.

*Note: With zero acceleration in the x-direction, only one of our formulas will be helpful:

Ex 1: A cannonball is launched at 40 m/s at a 30^0 angle above the horizontal and lands at the same height.

A) How long is it in the air?

B) How far away does it land?

Ex 2: A marble rolls off a table at 4.2 m/s and lands 1.6 m away. What is the height of the table?

Ex 3: A soccer ball is kicked at 23 m/s at an angle of 60^0 above the horizontal. It bounces off a building 17 m away.

A) At what height does it strike the building?

B) What is the ball's maximum height? (Assume the building does not get in the way).