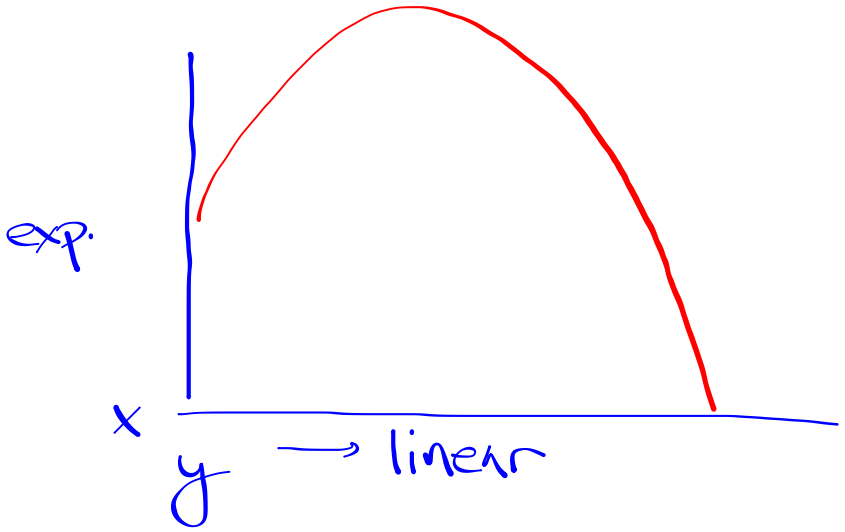
Parabolic / Projectile Motion:



When objects are moving in two dimensions, their motion is completely independent in the x- and y-axis.

→ with constant a, we can use the Big 4 for x- and y- separately

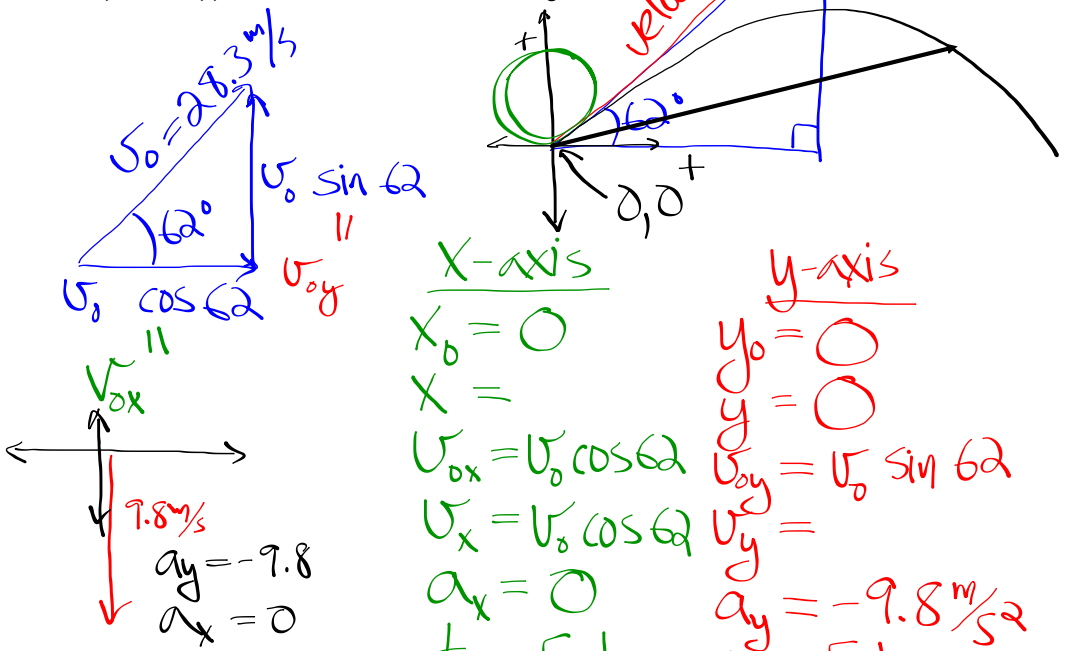
2 dimensional
object is dropped/thrown

Steps to Solving Problems:

1. Identify vectors in problem & break them into x-, y-components
2. Do same stuff as before
3. If necessary, resolve component vectors into resultant vectors

A ball is kicked from the ground at an angle of 62°. It lands, back on the ground, 5.1 seconds later. Find:

a) The ball's initial velocity
b) How far the ball traveled horizontally
c) The ball's final velocity
d) The ball's maximum height
e) The ball's x- and y- coordinates after 4 seconds
f) The time(s) at which the ball is 14 m above the ground



X-axis

$x_0 = 0$

$x =$

$v_{0x} = v_0 \cos 62$

$v_x = v_0 \cos 62$

$a_x = 0$

$t = 5.1$ s

Y-axis

$y_0 = 0$

$y = 0$

$v_{0y} = v_0 \sin 62$

$v_y =$

$a_y = -9.8$ m/s^2

$t = 5.1$ s

$$x = x_0 + v_0 t + \frac{1}{2} a t^2$$

$$0 = 0 + (v_0 \sin 62)5.1 + \frac{1}{2}(-9.8)(5.1)^2$$

$$v_0 = \frac{\frac{1}{2}(9.8)(5.1)^2}{5.1(\sin 62)} = 28.3 \text{ m/s}$$