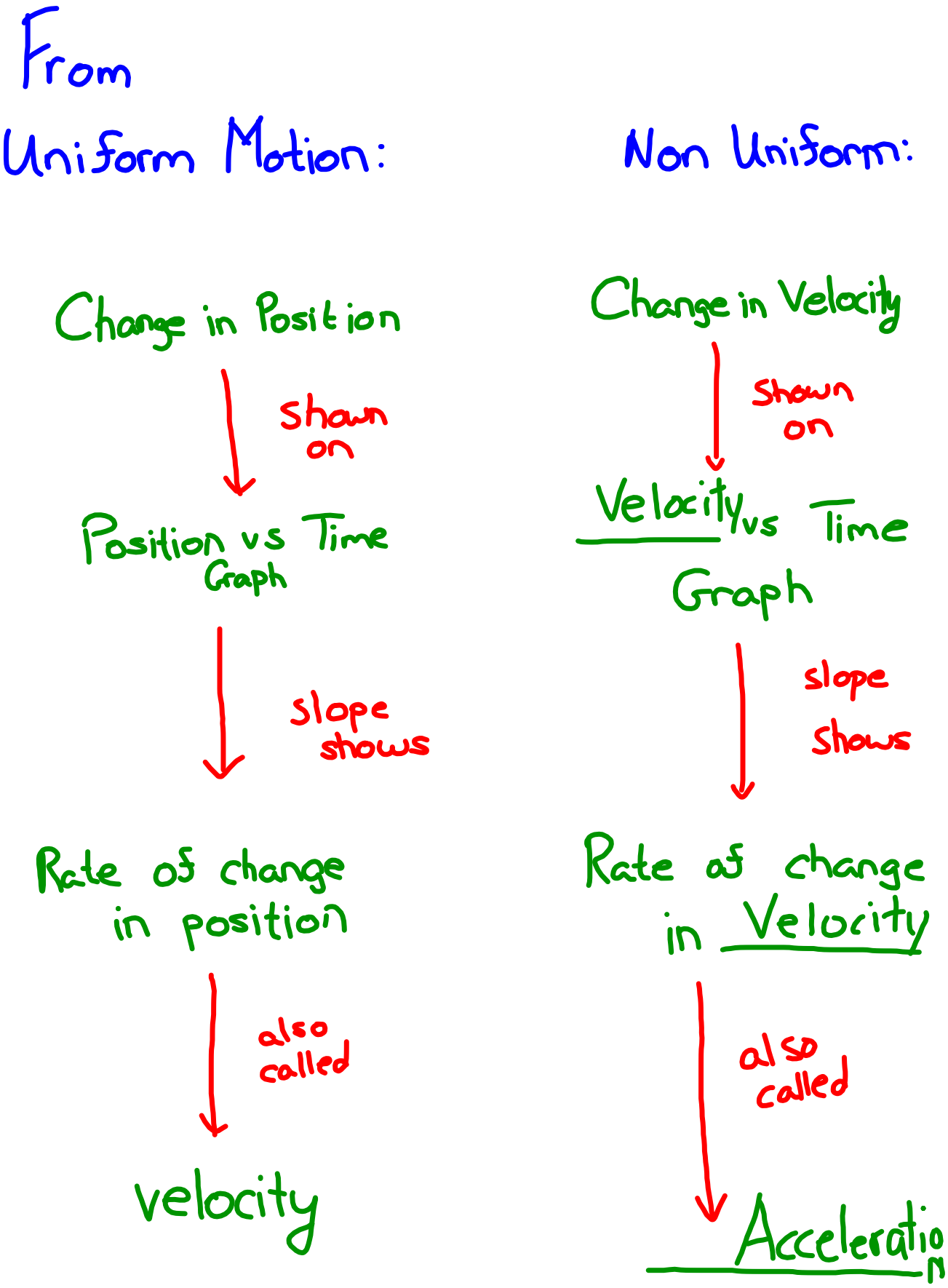
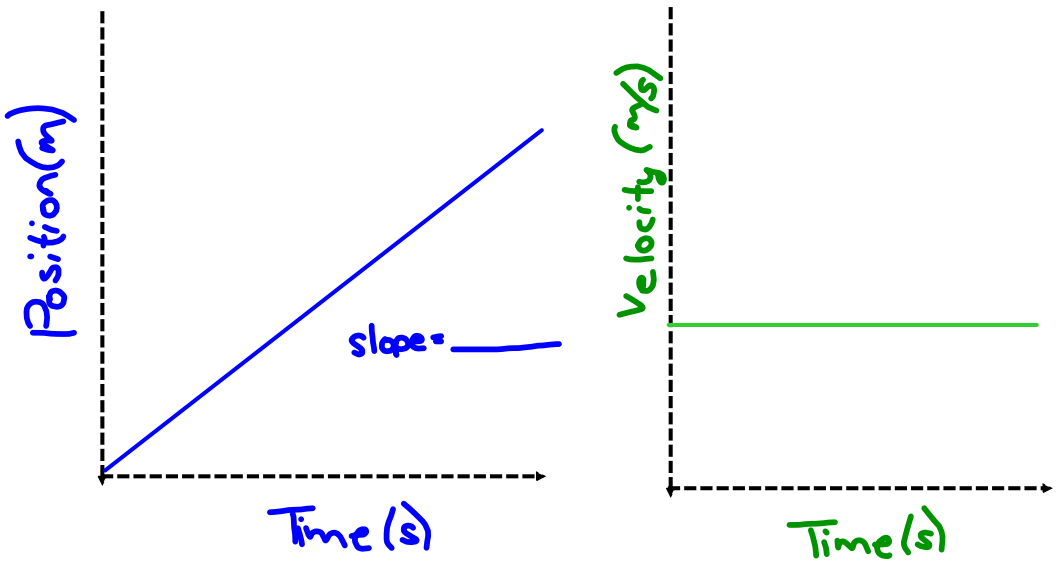
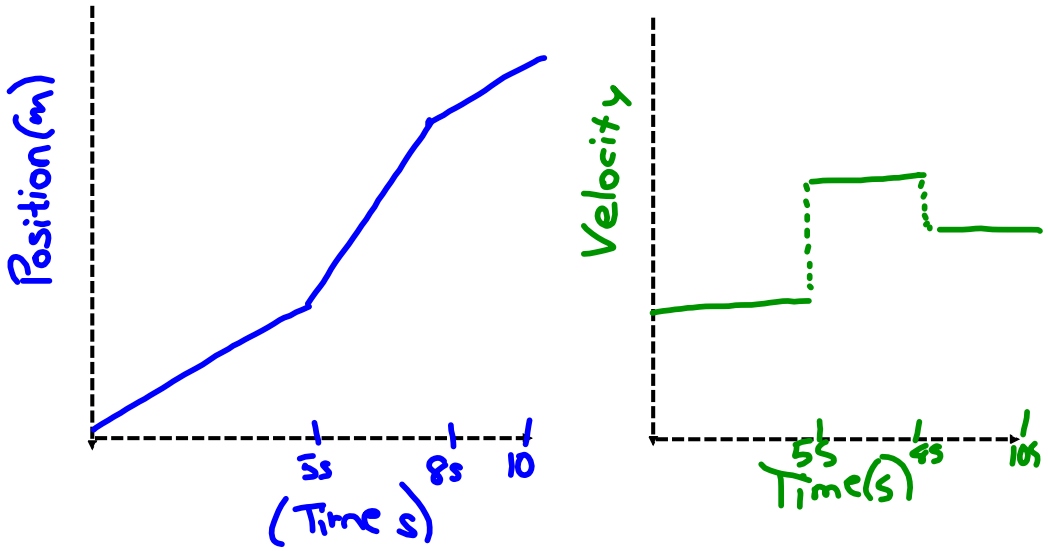
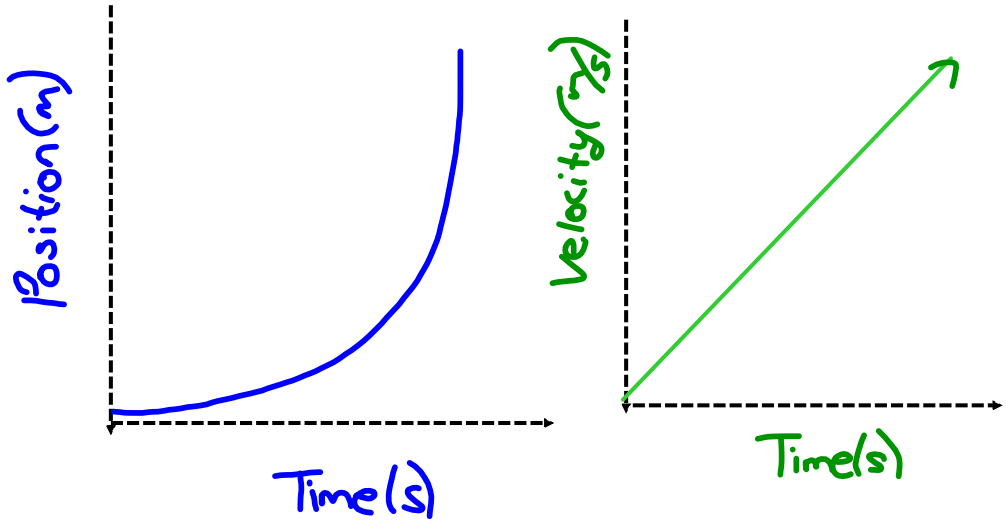

From
Uniform Motion:
Change in Position
shown on
Position vs Time Graph
slope shows
Rate of change in position
also called
velocity
Non Uniform:
Change in Velocity
shown on
Velocity vs Time Graph
slope shows
Rate of change in Velocity
also called
Acceleration

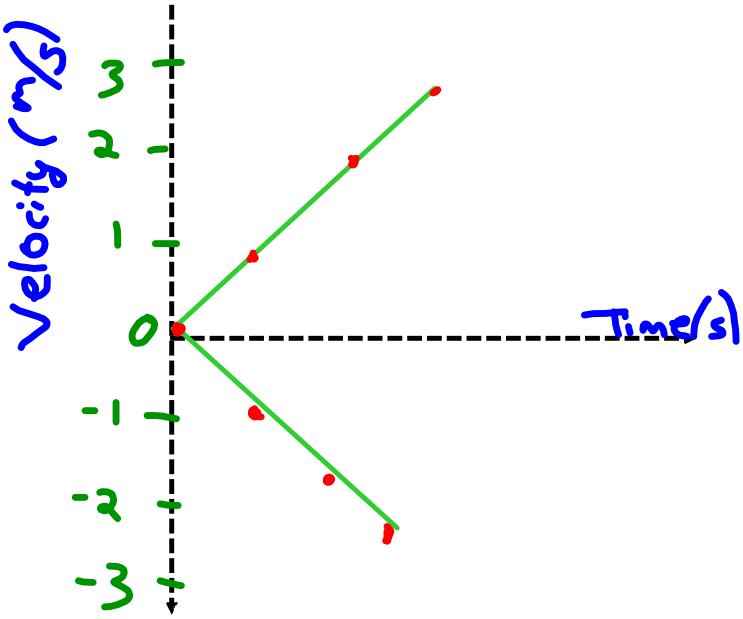
Non Uniform Motion Graphs

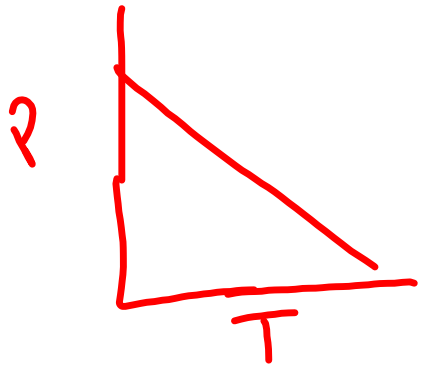






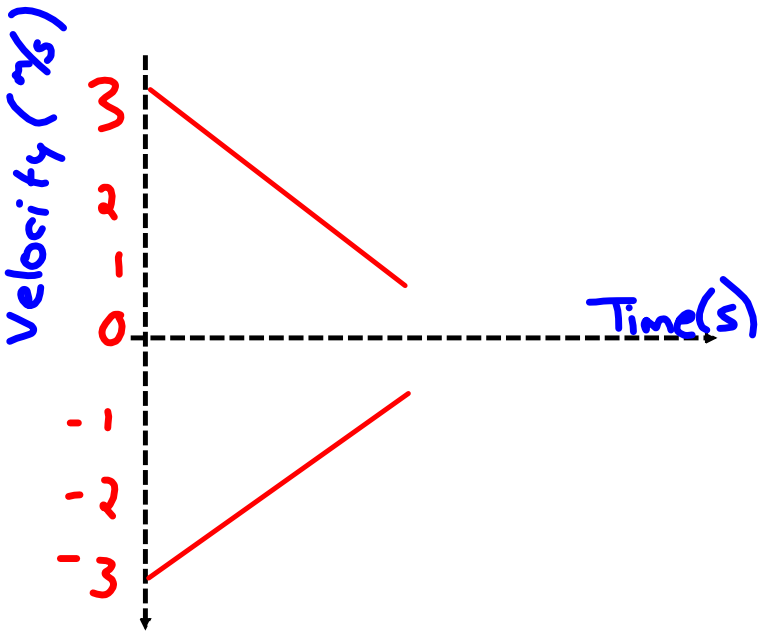
Speeding Up



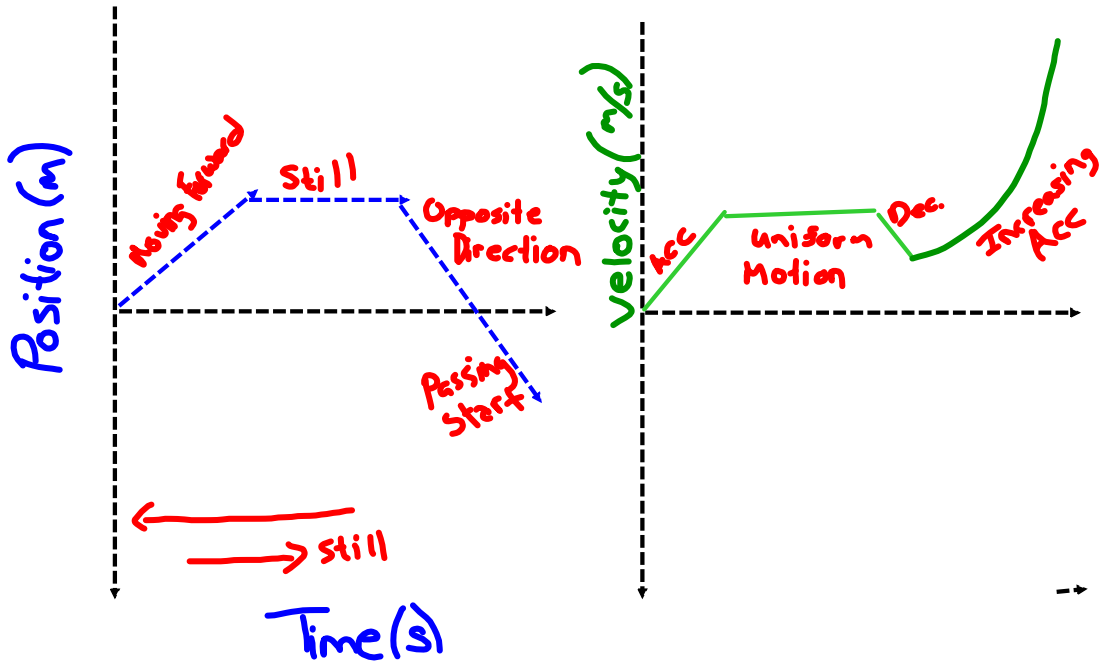


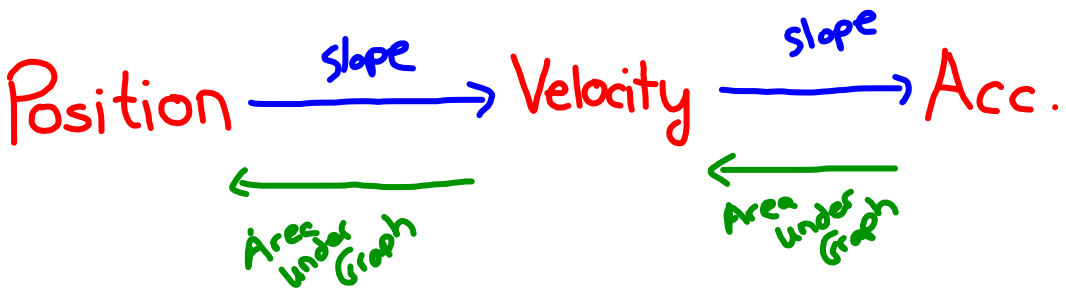
Opposite Direction

Slowing Down

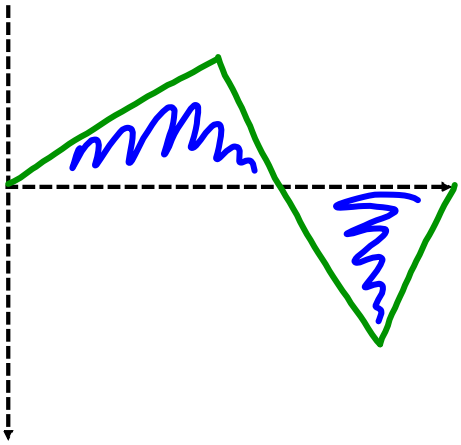


Non Uniform Motion Graphs





* Area under graph means area between graph and x=0.



Acceleration due to Gravity

gravity = $9.8 m/s^2$ downward

Equations

$$d = (V_i)(t) + \frac{1}{2}(a)(t^2)$$

$$V_f^2 = V_i^2 + 2(a)(d)$$

$$V_f = V_i + (a)(t)$$

$$d = \frac{V_i + V_f}{2}(t)$$

Free Falling Objects

- will experience a downward acceleration

- velocity and acceleration are in the same direction.

Example 1:

Meghan drops a water balloon from the roof of the school. It takes 3.5s to hit the ground. How tall is the school?

$a = 9.8 \frac{m}{s^2}$

We are given:

t=3.5s

We know:

Vi=0m/s

a=9.8m/s downward

We are looking for:

d

Which formula should we use?

d= (Vi) (t) + 1/2 (a) (t^2)

Example 2:

A stone is thrown straight down from the top of a cliff with an initial velocity of 6.0m/s. It reaches the bottom in 3.0s.

How high is the cliff?

Given

$V_i = 6\ m/s$

$t = 3.0\ s$

$a = 9.8\ m/s^2$

$d = ?$

$d = v_i(t) + \frac{1}{2}at^2$

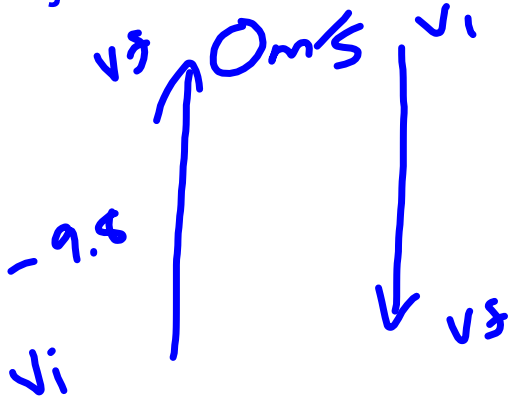
$d = (6)(3) + \frac{1}{2}(9.8)(9)$

$d = 18 + \frac{1}{2}(9.8)(9)$

$62.1\ m$

Thrown Objects:

-objects thrown into the air experience two different accelerations (slowing down upwards and speeding up when falling back down. At the very top the object will have a velocity of 0m/s)



Example 3:

A tennis player throwns a ball upward at 15m/s.

What is its velocity after 2.0m/s

$V_i = 15 \frac{m}{s}$

$t = 2.0\,s$

$a = -9.8 \frac{m}{s^2}$

$V_f = ?$

$V_f = V_i + a(t)$

$= (15) + (-9.8)(2)$

$V_f = +4.6 m/s$

Example 4: With what speed must a ball be thrown vertically upward in order to rise to a height of 16m?

How long will this ball be in the air?

$d = 16m$

$a = -9.8 m/s^2$

$V_f = 0$

$V_i = ?$

$V_f^2 = V_i^2 + 2(a)(d)$

$0 = V_i^2 + 2(-9.8)(16)$

$0 = V_i^2 + (-313.6)$

$+313.6 \quad +313.6$

$313.6 = V_i^2$

$\sqrt{313.6} = \sqrt{V_i^2}$

$17.7 = V_i$

m/s