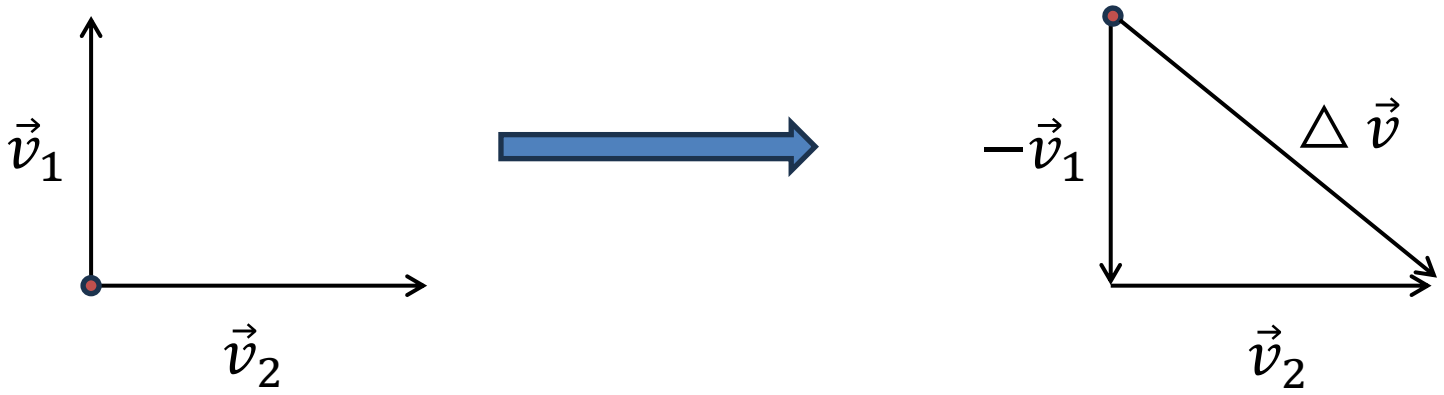
Acceleration

$$\vec{a} = \frac{\triangle \vec{v}}{\triangle t}$$

Change in velocity → $\triangle \vec{v} = \vec{v}_2 - \vec{v}_1$

Change in time → $\triangle t = t_2 - t_1$

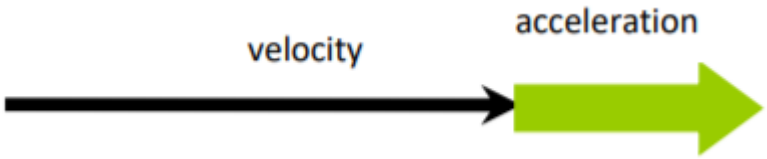
Vector addition:



Velocity after time t

$$\vec{v} = \vec{v}_0 + \vec{a} \cdot t$$

Rectilinear motion:



$\Rightarrow$

$$v = v_0 + a \cdot t$$

$\Rightarrow$

$$v = v_0 - a \cdot t$$

Homework 3

Problem 1. Imagine that you dropped a penny from the Empire State Building (please, never do it in real life!). Calculate the speed of the coin in 5 seconds.

Problem 2. Tesla's Model S Plaid is one of the fastest-accelerating production cars. It reaches 60 mph in just 2.3 seconds. Find its acceleration and compare it to the free fall acceleration on Earth, g (note that you will need some unit conversion to carry out the comparison!). Now assume that a car traveling at a speed 60 mph starts braking with acceleration -4 m/s^2. How long would it take to stop?

Problem 3. A ball with zero initial velocity falls from a height of 5m and hits the ground in 1 second. Find average velocity of the ball and compare it to the velocities of the ball in the beginning and in the end of the motion.