

Suppose you drop a rock from a height of 100 m. How far does the rock travel in the last 3 seconds before it hits the ground?

You drop a rock from a height  $h$  the same moment your friend throws a rock upward at speed  $v$ . When the rocks collide, the falling rock has 4 times the instantaneous velocity of the upwardly moving thrown rock. What height,  $h_{\text{collide}}$ , did the collision occur?

A quarterback notices that a defensive lineman is bearing down on him. At  $t=0$ , the lineman has a position of  $x = -10$  m, velocity of  $10$  m/s. The quarterback needs to buy  $1.5$  second with his legs, if he starts accelerating at  $5$  m/s<sup>2</sup>, can he buy this extra time?

Suppose the position of a particle is given by  $x(t) = 6t^2 - 10t + 5$  m. What is the instantaneous velocity?  
What is the acceleration?

Suppose I tell you that the acceleration of a particle is given by  $a(t) = 4t^3 - 6t^2$  m/s<sup>2</sup>. (a) find its velocity as a function of time assume that at  $t = 0$ , it had a velocity of  $-6$  m/s (b) Find its position as a function of time if it starts out at  $x=0$ ?