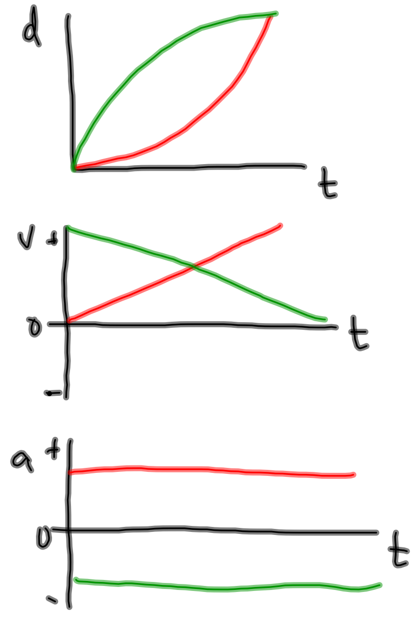
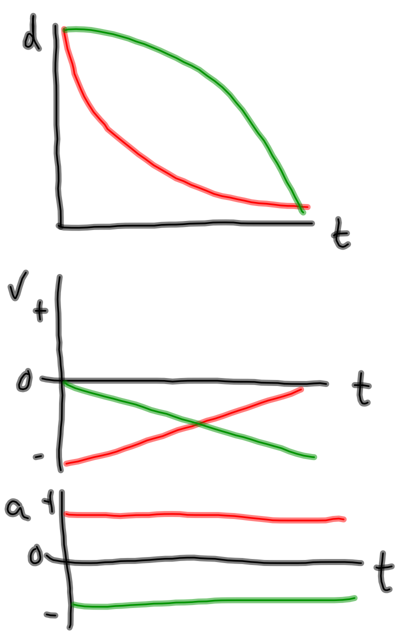
Kinematic Graphs for Changing Motion



- speeding⁺ up steadily going ⁺away
  (+ acc)
- slowing⁻ down steadily going ⁺away
  (− acc)



- slowing down (−) steadily while going towards (−)

  + acc

- speeding up (+) steadily while going towards (−)

  − acc

Acceleration Problems

mp/77

$\vec{v}_1 = 0$ (implied)

$\vec{a} = 5.2 m/s^2$ [downhill]

$\Delta t = 8.5 s$

$\vec{v}_2 = ??$

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

$$\vec{a} = \frac{\vec{v}_2 - \vec{v}_1}{\Delta t}$$

$$\vec{a}\Delta t = \vec{v}_2 - \vec{v}_1$$

$$\vec{v}_2 = \vec{v}_1 + \vec{a}\Delta t$$

$$\vec{v}_2 = 0 + (5.2 m/s^2 [\text{downhill}])(8.5 s)$$

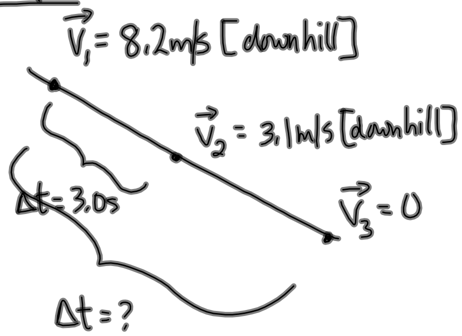
$$\frac{m}{s^2} \cdot \frac{s}{1} = \frac{m}{s}$$

$$\vec{v}_2 = 44.2 \frac{m}{s} [\text{downhill}]$$

$$\vec{v}_2 \doteq 44 \frac{m}{s} [\text{downhill}]$$

After 8.5 s, the boulder will have a velocity of $44 \frac{m}{s}$ [downhill].

MP/78



acceleration is constant

Find the acceleration:

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

$$\vec{a} = \frac{\vec{v}_2 - \vec{v}_1}{\Delta t}$$

$$\vec{a} = \frac{3.1\,m/s\,[\text{downhill}] - 8.2\,m/s\,[\text{downhill}]}{3.0s}$$

$$\vec{a} = \frac{-5.1\,m/s\,[\text{downhill}]}{3.0s}$$

$$\vec{a} = -1.7\,m/s/s\,[\text{downhill}]$$
or m/s^2

Now find the time to stop:

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

$$\vec{a} = \frac{\vec{v}_3 - \vec{v}_1}{\Delta t}$$

$$\vec{a}\,\Delta t = \vec{v}_3 - \vec{v}_1$$

$$\Delta t = \frac{\vec{v}_3 - \vec{v}_1}{\vec{a}}$$

$$\Delta t = \frac{0 - 8.2\,m/s\,[\text{downhill}]}{-1.7\,m/s^2\,[\text{downhill}]}$$

$$\Delta t = \frac{-8.2\,m/s\,[\text{downhill}]}{-1.7\,m/s^2\,[\text{downhill}]}$$ ← directions must match

$$\frac{m/s}{m/s^2} = \frac{m}{s} \cdot \frac{s^2}{m} = s$$

$$\Delta t = 4.8\,s$$

It took the skier 4.8s to come to a stop (after initially falling)

TO DO:
1. PP/80
2. Read over Chapter 2 & p74-77
3. Calculator Pad.