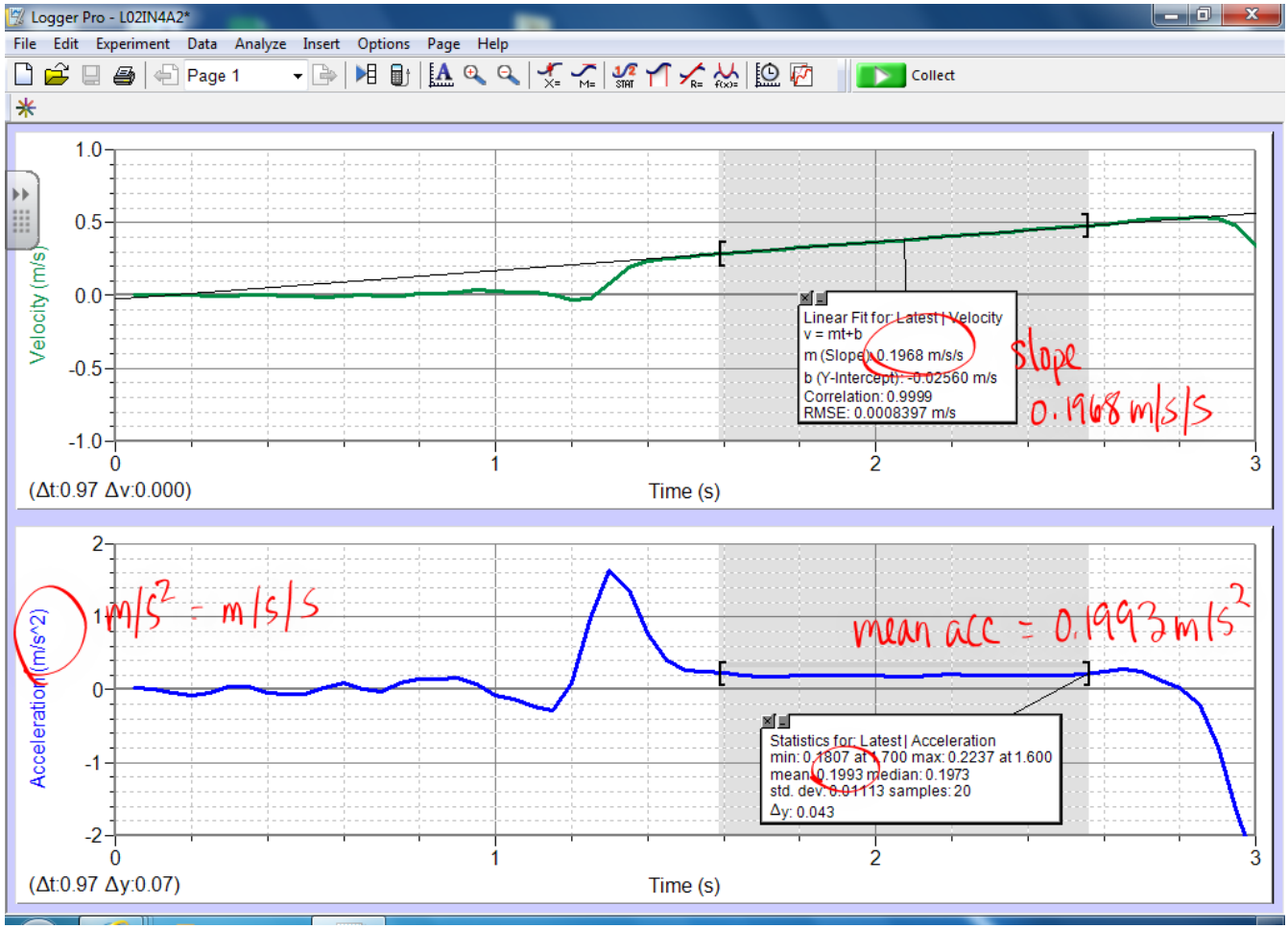
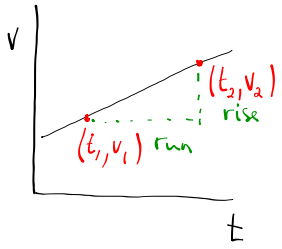

Logger Pro - L02IN4A2*
File Edit Experiment Data Analyze Insert Options Page Help
Page 1
Collect
Velocity (m/s)
1.0
0.5
0.0
-0.5
-1.0
0
1
2
3
(Δt:0.97 Δv:0.000)
Time (s)
Linear Fit for: Latest | Velocity
v = mt+b
m (Slope): 0.1968 m/s/s
b (Y-Intercept): -0.02560 m/s
Correlation: 0.9999
RMSE: 0.0008397 m/s
slope
0.1968 m/s/s
Acceleration (m/s^2)
2
1
0
-1
-2
m/s² = m/s/s
mean acc = 0.1993 m/s²
Statistics for: Latest | Acceleration
min: 0.1807 at 1.700 max: 0.2237 at 1.600
mean: 0.1993 median: 0.1973
std. dev: 0.01113 samples: 20
Δy: 0.043
(Δt:0.97 Δy:0.07)
Time (s)

Acceleration and v-t graphs

Constant Acceleration



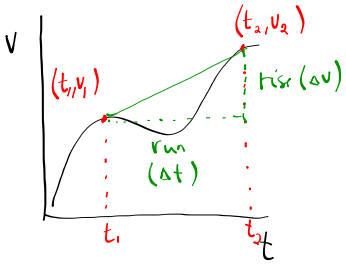
$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

$$\text{slope} = \frac{\Delta v}{\Delta t}$$

From Investigations, we know that the slope on a v-t graph is the same as the acceleration.

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

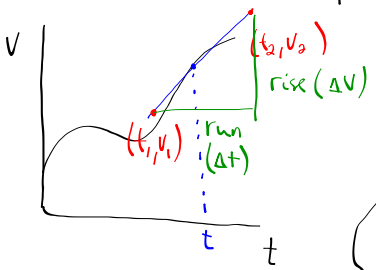
Non-Constant Acceleration



$$\text{slope} = \frac{\Delta v}{\Delta t}$$

$$a_{ave} = \frac{\Delta v}{\Delta t}$$

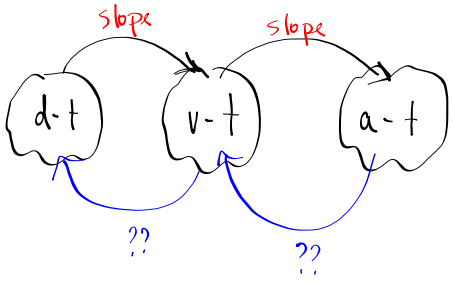
Average acceleration is the slope of the line connecting two points on the v-t graph.



$$\text{slope} = \frac{\Delta v}{\Delta t}$$

$$a_{inst} = \frac{\Delta v}{\Delta t}$$

The instantaneous acceleration is the slope of the tangent drawn at time t.



Acceleration

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

MP 1.7

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

m/s/s

$\Delta t = 8.5\ s$

$\vec{v}_1 = 0$

$\vec{v}_2 = ?$

Units: $\frac{m}{s^2} \cdot s = \frac{m}{s}$

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

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

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

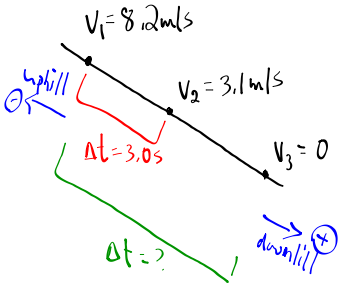
$$\vec{v}_2 = \vec{v}_1 + \vec{a}\Delta t$$

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

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

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

MP|78



Find acceleration:

$$a = \frac{\Delta V}{\Delta t}$$

$$a = \frac{V_2 - V_1}{\Delta t}$$

$$a = \frac{3.1 m/s - 8.2 m/s}{3.0 s}$$

$$a = \frac{-5.1 m/s}{3.0 s}$$

$$a = -1.7 m/s^2$$

$$\vec{a} = 1.7 m/s^2 \text{ [uphill]}$$

(slowing down going downhill)

units:

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

Now find Δt to stop:

$$a = \frac{\Delta V}{\Delta t}$$

$$a = \frac{V_2 - V_1}{\Delta t}$$

$$a \Delta t = V_2 - V_1$$

$$\Delta t = \frac{V_2 - V_1}{a}$$

$$\Delta t = \frac{0 - 8.2 m/s}{-1.7 m/s^2}$$

$$\Delta t = \frac{-8.2 m/s}{-1.7 m/s^2}$$

$$\Delta t = 4.8 s$$

units:

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

TO DO:

- PP|80
- Read p61-64 and p74-77