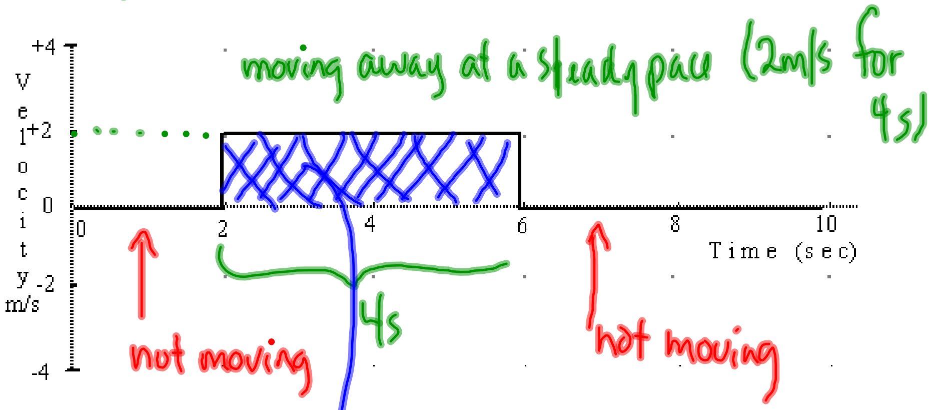
5. The velocity-time graph of an object is shown below. Figure out the total *distance* traveled by the object. Show your work.

Distance = ___8___ meters.



Area under a v-t graph is equal to the displacement

Shaded Area is a rectangle

Area = l x w

Area = (4s)(2m/s)

Area = 8m

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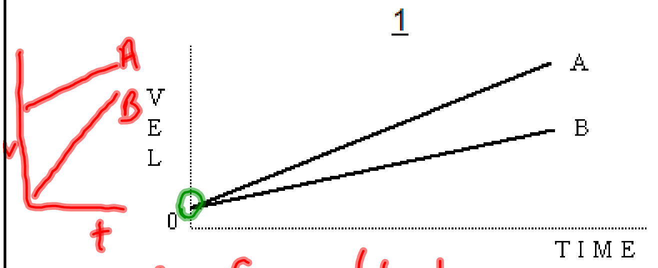
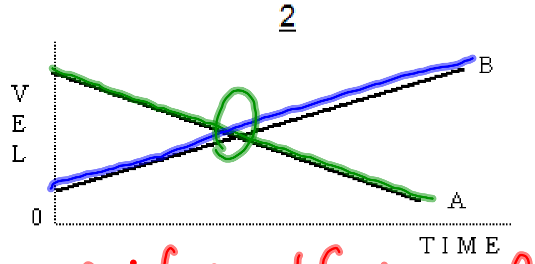


a) A is faster (higher on the graph)

b) A and B have the same velocity at the same time

c) You cannot tell which object is ahead from a v-t graph

d) Neither A or B is moving away



a) A is faster at first, then B

b) "

c) "

d) "

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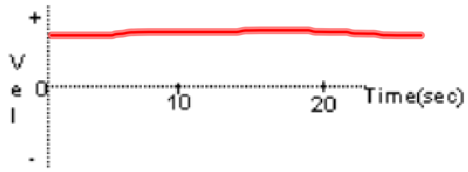
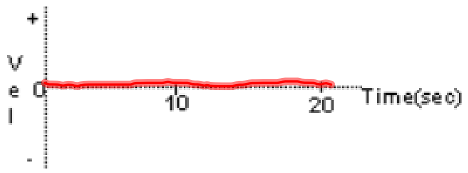
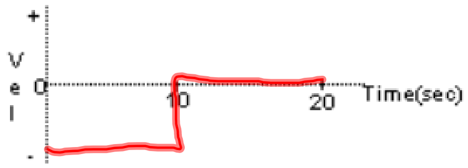
7. The object is moving away from the origin at a steady (constant) velocity.



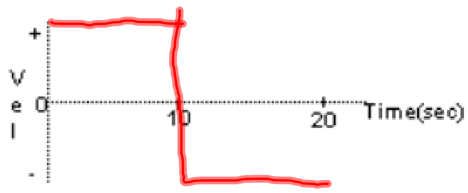
8. The object is standing still.

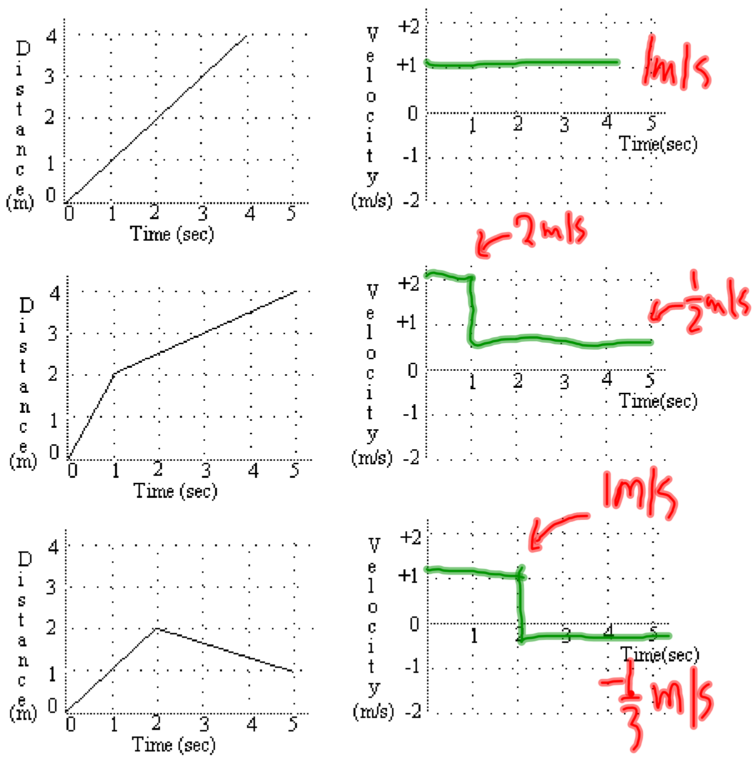


9. The object moves toward the origin at a steady (constant) velocity for 10 seconds, and then stands still for 10 seconds.



10. The object moves away from the origin at a steady (constant) velocity for 10 seconds, reverses direction and moves back toward the origin at the same speed for 10 seconds.




Distance (m)
Time (sec)
Velocity (m/s)
Time(sec)
1m/s
2m/s
1/2 m/s
1m/s
-1/3 m/s

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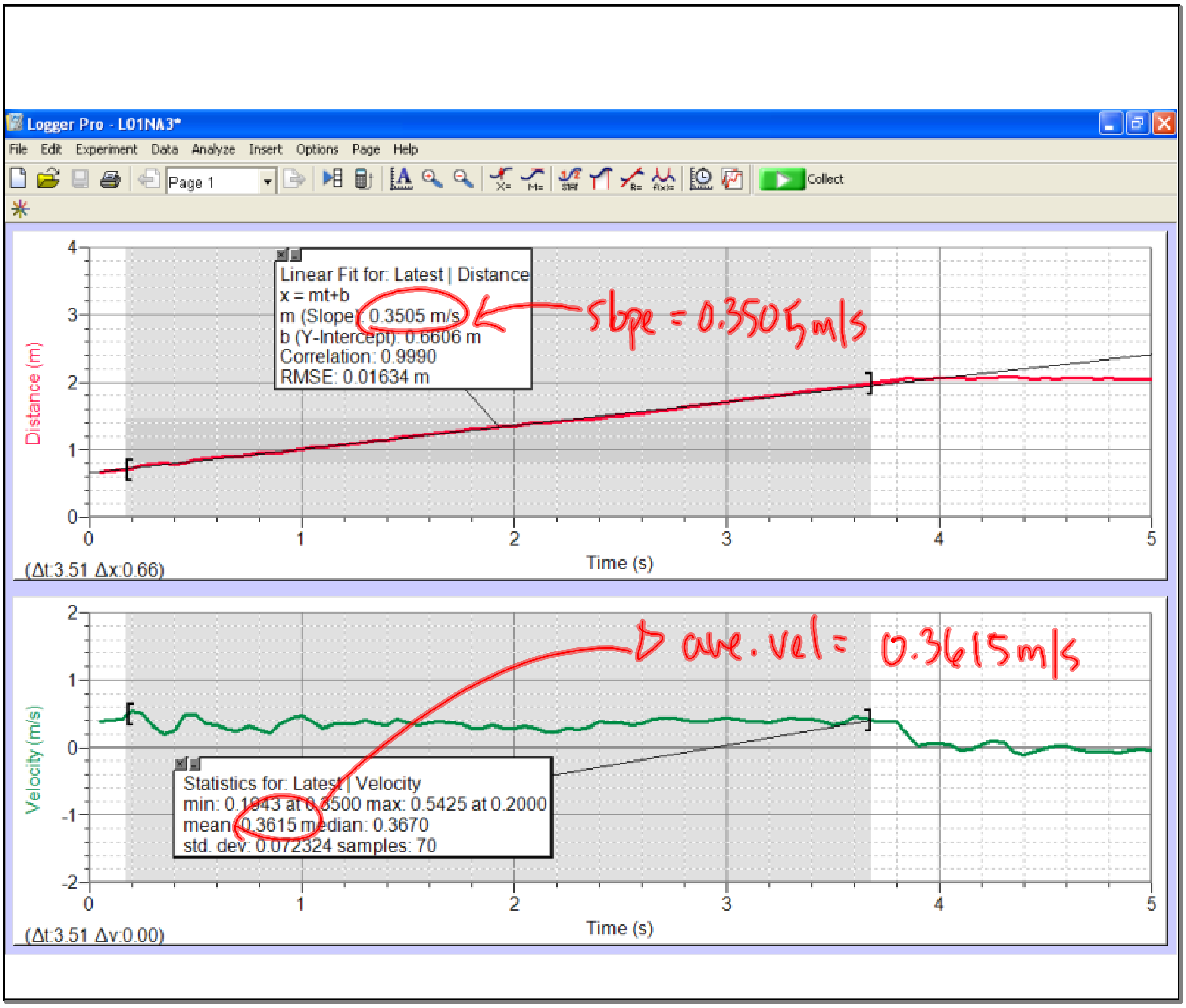
Logger Pro - L01NA3*
File Edit Experiment Data Analyze Insert Options Page Help
Page 1
Collect
Linear Fit for: Latest | Distance
x = mt+b
m (Slope): 0.3505 m/s
b (Y-Intercept): 0.6606 m
Correlation: 0.9990
RMSE: 0.01634 m
slope = 0.3505 m/s
Distance (m)
Time (s)
(Δt:3.51 Δx:0.66)
ave. vel = 0.3615 m/s
Statistics for: Latest | Velocity
min: 0.1943 at 0.8500 max: 0.5425 at 0.2000
mean: 0.3615 median: 0.3670
std. dev: 0.072324 samples: 70
Velocity (m/s)
Time (s)
(Δt:3.51 Δv:0.00)

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Velocity and Position-Time Graphs

Scalar quantity ~ 10g, 15s, 22.5km ← have only magnitude (size)

vector quantity ~ 32km/h [E], 50km [N] ← have magnitude + direction

position ($\vec{d}$) ~ where an object is in relation to a reference (vector)

displacement ($\Delta\vec{d}$) ~ change in position; where the object is now in relation to where it started (vector)

distance (Δd) ~ how far the object has travelled (scalar)

velocity ($\vec{v}$) ~ rate of change in position (vector)

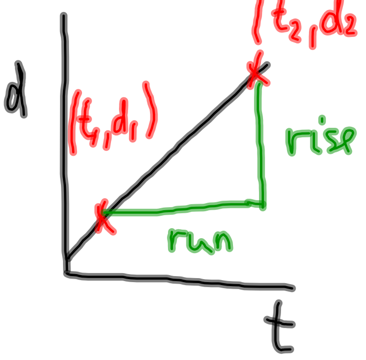
Speed (v) - how fast (scalar)

distance → speed

displacement → velocity

Position-Time Graphs

CONSTANT VELOCITY



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

$$\text{Slope} = \frac{\Delta d}{\Delta t}$$

From INV 3, we know that the slope on a d-t graph equals velocity

$$v = \frac{\Delta d}{\Delta t} \qquad \vec{v} = \frac{\Delta \vec{d}}{\Delta t}$$

$$\left(\text{speed} = \frac{\text{distance}}{\text{time}}\right) \qquad \left(\text{velocity} = \frac{\text{displacement}}{\text{time}}\right)$$

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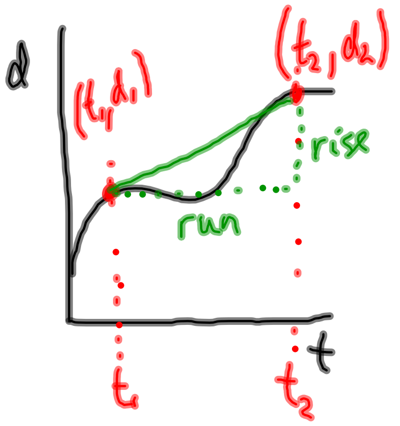
Non-Constant Velocity



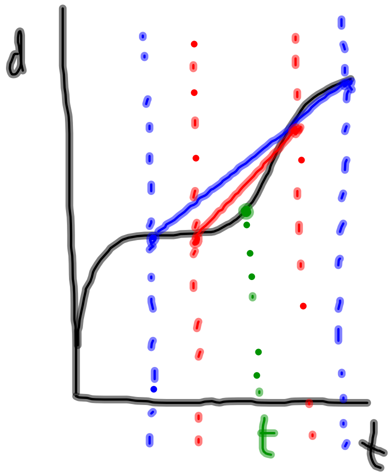
$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

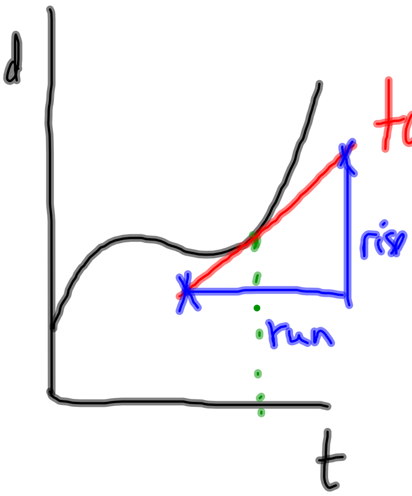
$$\text{slope} = \frac{\Delta d}{\Delta t}$$

$$V_{ave} = \frac{\Delta d}{\Delta t}$$

The average velocity can be found from the slope of the line joining two points on a d-t graph

What if we want to know the velocity at specific time when the velocity is NOT constant.





tangent - a line that touches a curve at only 1 point.

Instantaneous velocity can be found by drawing a tangent at time t + finding the slo

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

$$V_{inst} = \frac{\Delta d}{\Delta t}$$