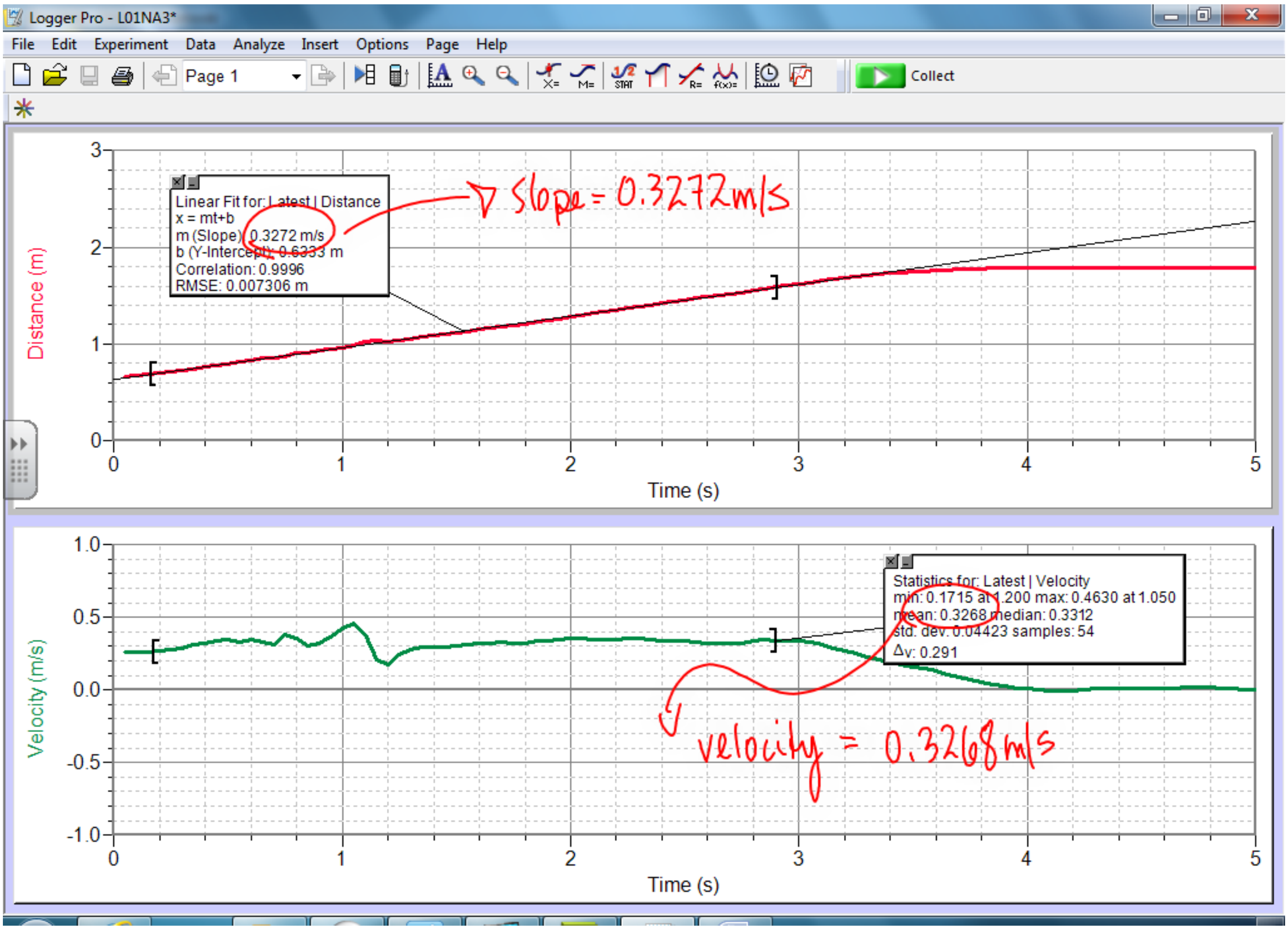


Linear Fit for: Latest | Distance
x = mt+b
m (Slope): 0.3272 m/s
b (Y-Intercept): 0.6333 m
Correlation: 0.9996
RMSE: 0.007306 m

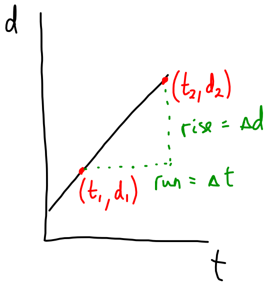
Slope = 0.3272m/s

Statistics for: Latest | Velocity
min: 0.1715 at 1.200 max: 0.4630 at 1.050
mean: 0.3268 median: 0.3312
std. dev: 0.04423 samples: 54
Δv: 0.291

velocity = 0.3268 m/s

Position-Time Graphs and Velocity

Constant Velocity



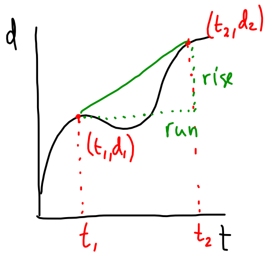
$$\text{Slope} = \frac{\text{rise}}{\text{run}}$$

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

From investigation 3, we know that slope (d-t) = velocity

$$\boxed{v = \frac{\Delta d}{\Delta t}}$$

Non-Constant Velocity

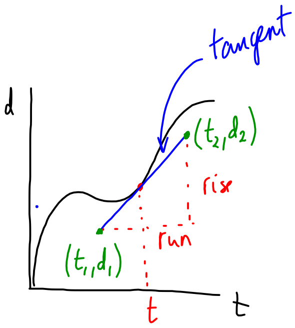


$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

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

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

The average velocity is the slope between two points on a position-time graph



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

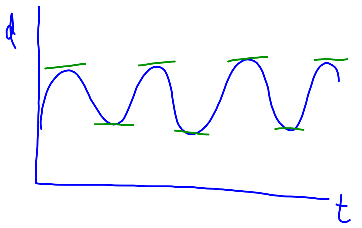
$$\text{slope} = \frac{\Delta d}{\Delta t}$$

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

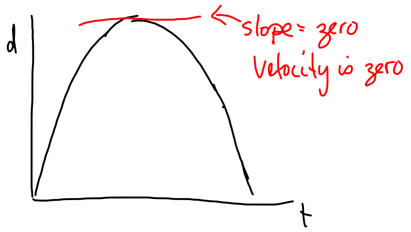
The instantaneous velocity is the slope of the tangent drawn at time t.

With your math background you can only "eye-ball" the tangent line to find instantaneous velocity.

Alternatively you could use calculus or technology.



← instantaneous velocity is zero!



← slope = zero
Velocity is zero

Terminology

position ($\vec{d}$) – where you are in relation to a reference point
(vector)

ex. 5 km [E]

displacement ($\Delta\vec{d}$) – where you are now in relation to where you started; change in position
(vector)

ex. 20 km [N30°E]

distance (Δd) – how far you travelled.
(scalar)

ex. 200 km

velocity ($\vec{v}$) – rate of change in your position.
(vector)

ex. 25 km/h [N]

speed (v) – how fast you cover the distance.
(scalar)

Using the velocity equation:

$$\vec{v} = \frac{\overset{\swarrow \text{displacement.}}{\Delta\vec{d}}}{\Delta t}$$

← should be able to rearrange for Δd or Δt.

$$\overset{\text{speed}}{\rightarrow} v = \frac{\overset{\swarrow \text{distance}}{\Delta d}}{\Delta t}$$

Scalars have only magnitude (size)
vectors have magnitude <u>AND</u> direction.