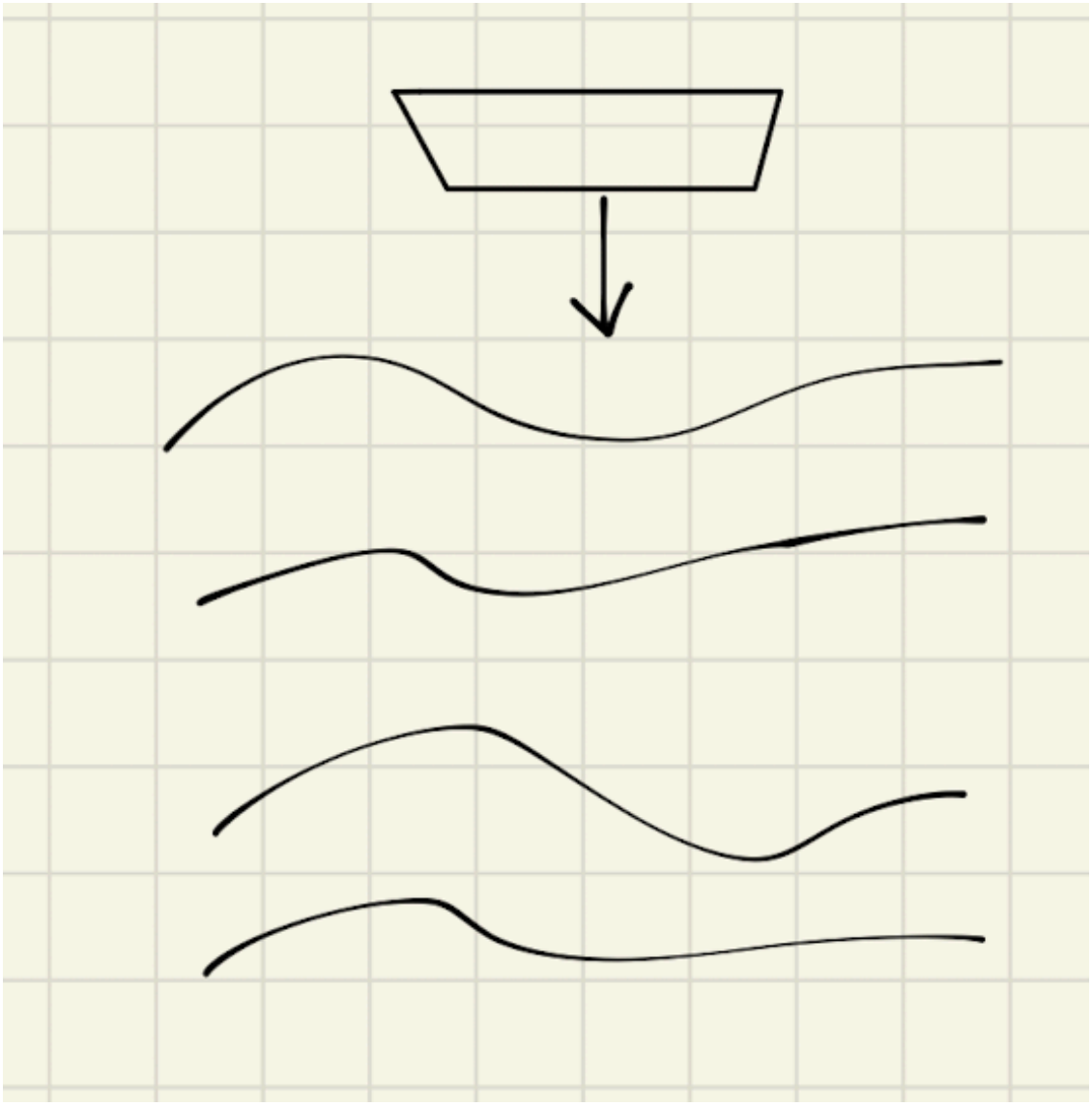
Nove



A thing pushes through a thing! How much influences does the air give it.

1 | **Factors of Influence**

- Cross-sectional/projected surface area
- Velocity — some kind of
- Shape of the object

When we talk about drag, we are talking a force.

2 | **Drag Force**

$$F_{drag} = \frac{1}{2} C A \rho v^2 \tag{1}$$

Where…

- C is the drag coefficient, describing the shape of the object
- A is the projected area being pushed though
- ρ is the mass density of the object
- v is the velocity of travel

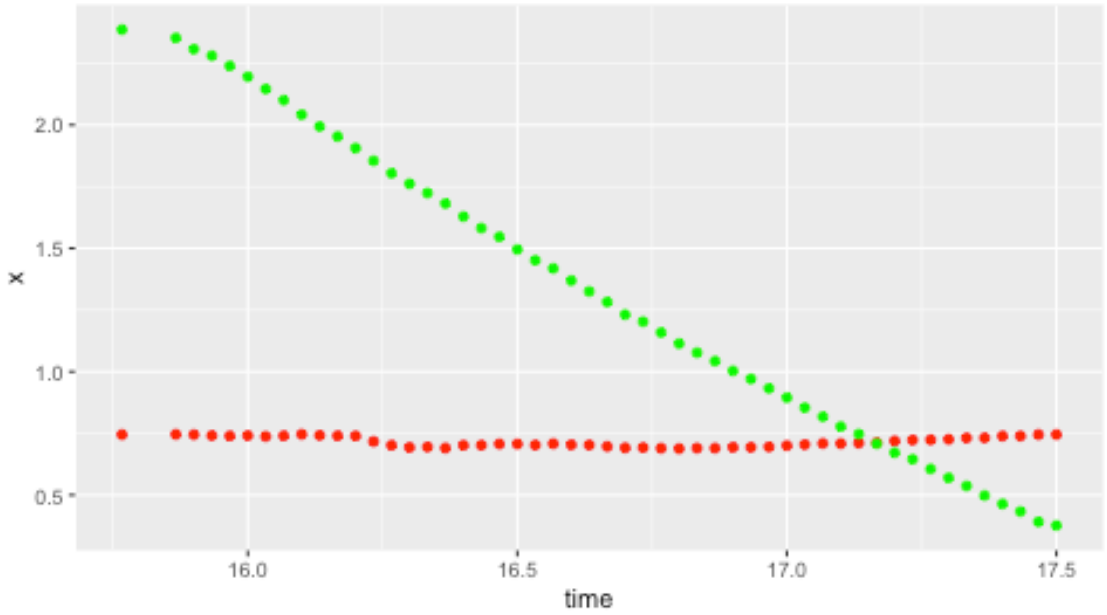
By default, atmospheric pressure makes it so that there is equal amounts of pressure up and down.

3 | **Analysis of the Curve**

```
library(tidyverse)

falldata <- read.csv("./falldata.csv", stringsAsFactors = TRUE)
head(falldata)

15.7666666667 0.744754495697 2.38654750623 0.00118434586778 -0.472766141311
15.8666666667 0.7458223158 2.3527575824 -0.0125149651894 -0.631378632933
15.9 0.744549708279 2.30732403114 -0.0469877455697 -0.921693908128
15.9333106576 0.741112205206 2.28080406062 -0.0553661266199 -1.05377203968
15.9666666667 0.739400767505 2.23921758726 -0.0238090877977 -1.2517487939
16 0.740936673134 2.19571488879 -0.0157900706024 -1.37188339643
```

Let's plot the basic information first!

```
plot <- ggplot(falldata) + geom_point(aes(x=time, y=x), color="red") + geom_point(aes(x=time, y=y), col
plot
```



We could see that, after just about four points, the graph is pretty much linear. Se we split the data into two pieces.

```
data_quadratic <- falldata[0:4,]
data_linear <- falldata[4:nrow(falldata)-1,]
```

Let's fit the line first by performing a linear regression.

```
regression = lm(time~y, data = data_linear)
regression
```

```

Call:
lm(formula = time ~ y, data = data_linear)

Coefficients:
(Intercept)            y
    17.7334      -0.8073
```

Furthermore, we also get a summary of how good this fit is.

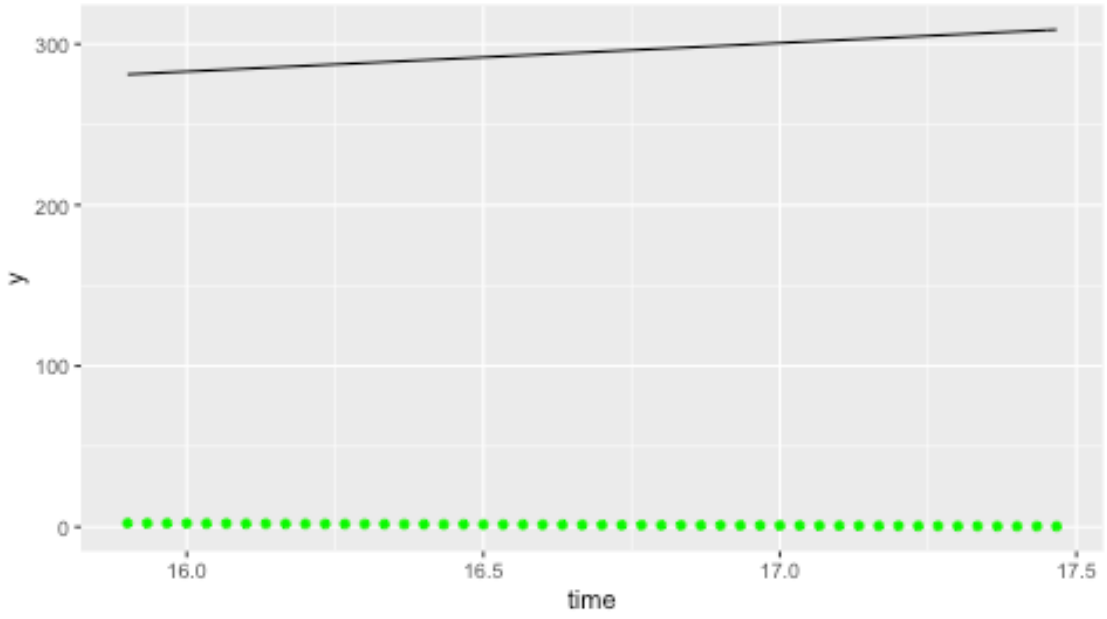
```
summary(regression)
```

```

Call:
lm(formula = time ~ y, data = data_linear)

Residuals:
      Min        1Q    Median        3Q       Max
-0.039309 -0.023095 -0.007461  0.023235  0.049528

Coefficients:
```

```
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 17.733354   0.009531  1860.5   <2e-16 ***
y           -0.807258   0.006709  -120.3   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.02655 on 46 degrees of freedom
Multiple R-squared:  0.9968,Adjusted R-squared:  0.9968
F-statistic: 1.448e+04 on 1 and 46 DF,  p-value: < 2.2e-16
```

Lastly, we plot the information + overlaid:

```
plot <- ggplot(data_linear) + geom_point(aes(x=time, y=y), color="green") + geom_function(fun=(function
plot
```



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