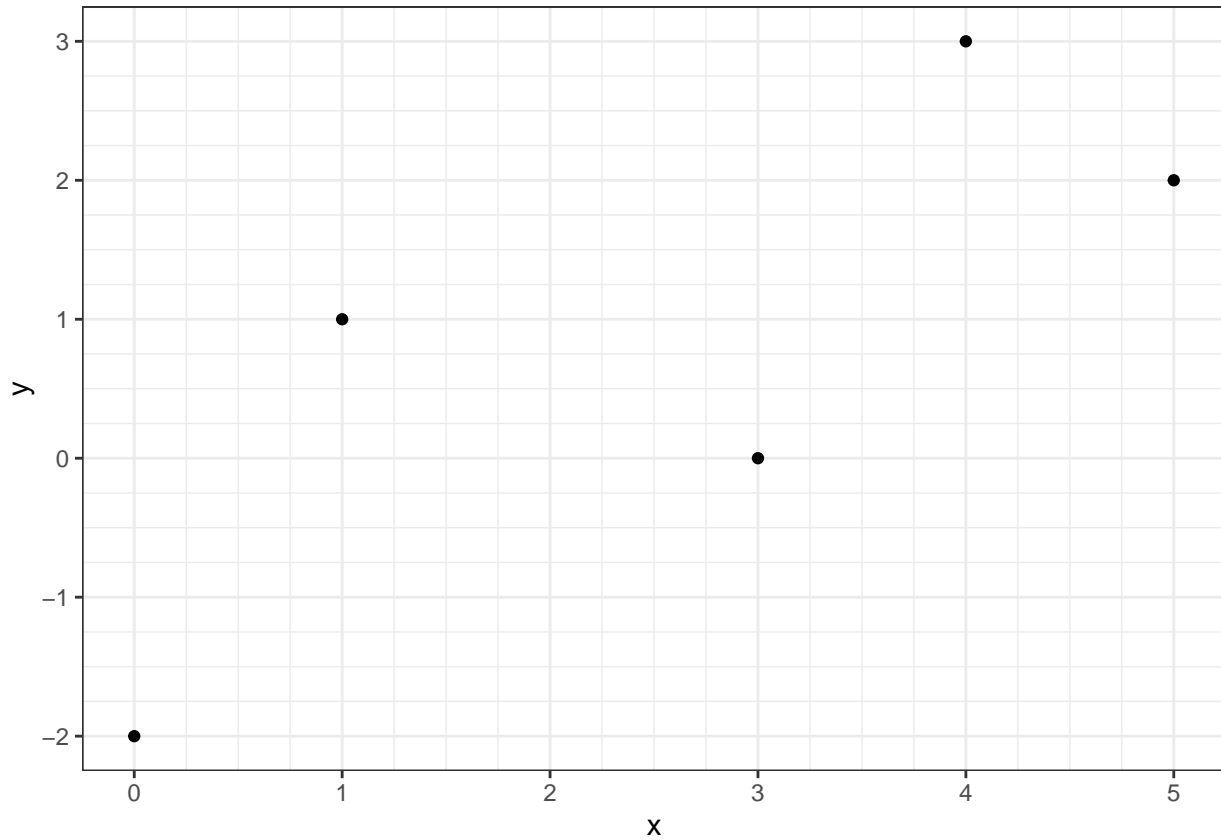


# Regression Lines

Stat 145



1. Add a line to the plot that “fits the data well”. Don’t do any calculations, just add the line.
2. Now estimate the **residuals** for each point relative to your line.
  - residual = observed value of  $y$  – predicted value of  $y$
  - predicted value of  $y$  = the value of  $y$  on the line (for a particular value of  $x$ )

3. Now square each residual and add the squared residuals together. This sum is sometimes written SSR for sum of squared residuals or SSE for sum of squared errors (even though error is a bit of a misnomer).

You may find it handy to use the following table to organize your work.

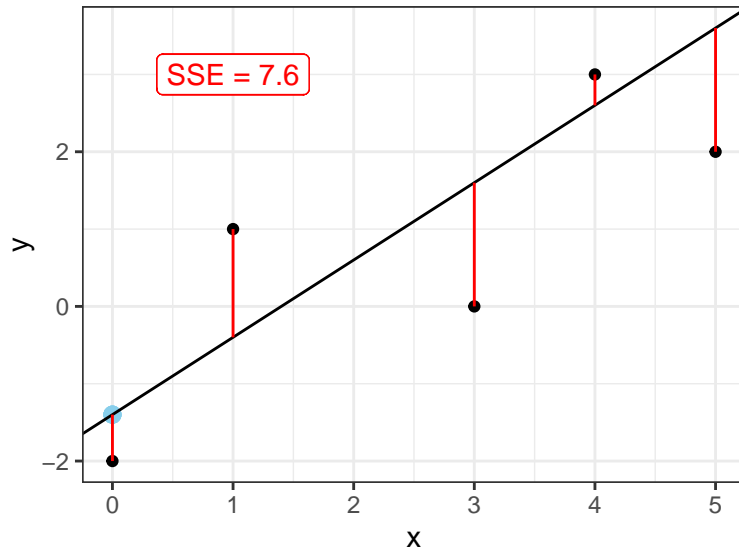
x	observed y	predicted y	residual	residual squared
0	-2			
1	1			
3	0			
4	3			
5	2			

4. Estimate the slope and intercept of your line.
- Recall slope =  $\frac{\text{rise}}{\text{run}}$ . You can compute this by choosing two points on your line and figuring out how much the y-values change (rise) and how much the x-values change (run).
  - The intercept is where your line hits the y-axis.
5. Check to see which person in your group has the smallest value for SSE. Double check their work.

Trying some lines to see how small SSE is

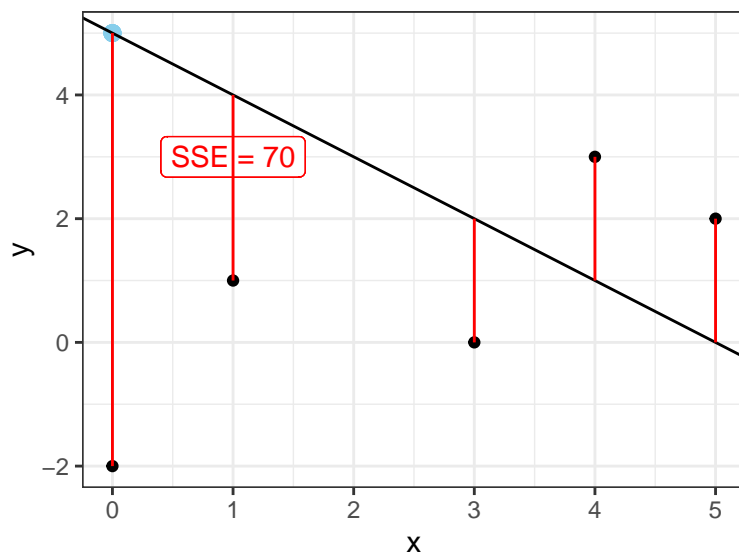
```
# Note: This SSE function is not available for general use  
SSE(slope = 1, intercept = -1.4)
```

##	x	y	observed	predicted	residual	
##	1	0	-2	-2	-1.4	-0.6
##	2	1	1	1	-0.4	1.4
##	3	3	0	0	1.6	-1.6
##	4	4	3	3	2.6	0.4
##	5	5	2	2	3.6	-1.6



```
SSE(slope = -1, intercept = 5.0)
```

##	x	y	observed	predicted	residual
##	1	0	-2	5	-7
##	2	1	1	4	-3
##	3	3	0	2	-2
##	4	4	3	1	2
##	5	5	2	0	2



## R can find the best line for us

Best in the sense of giving the smallest SSE value.

```
lm( y ~ x, data = someData)
```

```
##  
## Call:  
## lm(formula = y ~ x, data = someData)  
##  
## Coefficients:  
## (Intercept)          x  
##   -1.1047         0.7326
```

```
SSE(slope = 0.7326, intercept = -1.1047)
```

```
##  x  y observed predicted residual  
## 1 0 -2      -2  -1.1047 -0.8953  
## 2 1  1       1  -0.3721  1.3721  
## 3 3  0       0   1.0931 -1.0931  
## 4 4  3       3   1.8257  1.1743  
## 5 5  2       2   2.5583 -0.5583
```

