1. $$r = \frac{SS_{xy}}{\sqrt{SS_{xx}SS_{yy}}} = \frac{SS_{xy}}{SS_{xx}} \frac{SS_{xx}}{\sqrt{SS_{xx}SS_{yy}}} = b_1 \sqrt{\frac{SS_{xx}}{SS_{yy}}}$$

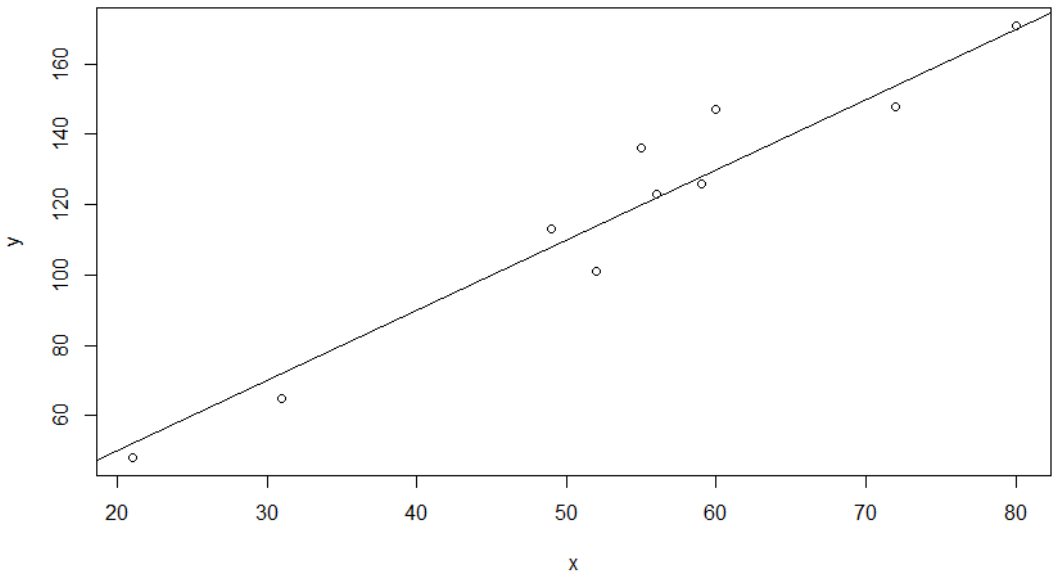
2. $$A^{-1}A = \frac{1}{ad-bc}\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \frac{1}{ad-bc}\begin{pmatrix} ad-bc & 0 \\ 0 & ad-bc \end{pmatrix}\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = I$$

3.

Code:

```
input_e3 <- read.csv("C:/Users/liujm/Desktop/input_e3.csv", header=FALSE)
x <- input_e3[,1]
y <- input_e3[,2]
plot(x,y)
abline(a=10, b=2)
lm(y~x)
```

3.1



3.2

```
Call:
lm(formula = y ~ x)

Coefficients:
(Intercept)            x
      4.365        2.120
```

4.

Code:

```
input_e3 <- read.table("C:/Users/liujm/Desktop/input_e3.csv", sep=',',header=FALSE)
x <- as.matrix(input_e3[,1:2])
y <- as.matrix(input_e3[,3])
t(x) %*% x
t(y) %*% y
solve(t(x) %*% x)
t(x) %*% y

b <- solve(t(x) %*% x)
c <- t(x) %*% y

b%*%c
```

4.1

```
> t(x) %*% x
    V1    V2
V1  10   535
V2 535 31333
```

4.2

```
> t(y) %*% y
       [,1]
[1,] 151754
```

4.3

```
> solve(t(x) %*% x)
           V1           V2
V1  1.15598598 -0.0197380557
V2 -0.01973806  0.0003689356
```

4.4

```
> t(x) %*% y
    [,1]
V1  1178
V2 68770
```

4.5

```
       [,1]
V1 4.365394
V2 2.120273
```

b0=V1, b1=V2, same results as question 3.