Homework 2

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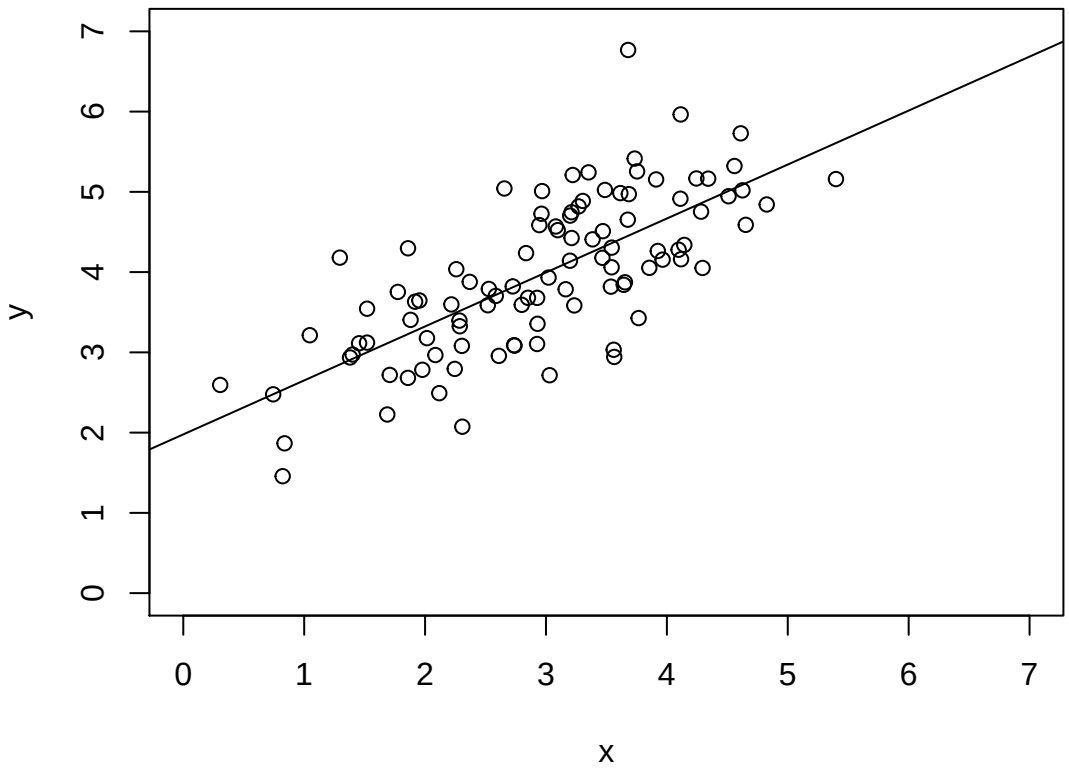
September 18, 2014

1.

b).

```
plot(datam$x, datam$y, xlim = c(0, 7), ylim = c(0, 7), type = 'p', xlab = "x", ylab = "y")
lm <- lm(y ~ x, data = datam)
abline(lm)
```




```
summary(lm)
```

```
##
## Call:
## lm(formula = y ~ x, data = datam)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.4562 -0.4958 -0.0067  0.5164  2.3153
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   1.9779     0.2050    9.65    7e-16 ***
## x             0.6724     0.0653   10.30   <2e-16 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.671 on 98 degrees of freedom
## Multiple R-squared:  0.52,   Adjusted R-squared:  0.515
## F-statistic:  106 on 1 and 98 DF,  p-value: <2e-16
```

$\hat{\alpha} = 1.63$
$\hat{\beta} = 0.79$
$\hat{\sigma} = 0.5559$ $R^2 = 0.6092$
Using F-test, the p-value is less than 2.2e-16, thus p-value < 0.05. We reject null hypothesis.

d).

```
1 - pt((1-0.79582)/0.06385, 98)
```

```
## [1] 0.0009325
```

p-value < 0.05. We reject the null hypothesis.

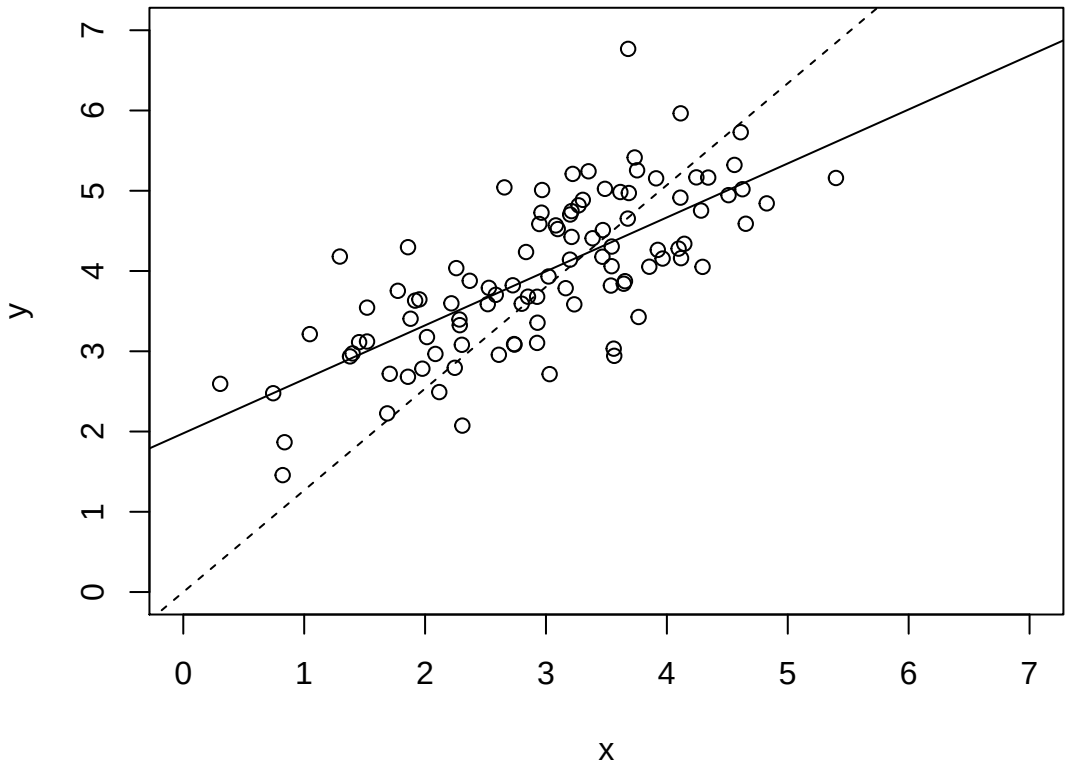
2.

a).

```
m0 <- lm(y ~ x -1 , data=datam)
summary(m0)
```

```
##
## Call:
## lm(formula = y ~ x - 1, data = datam)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -1.685 -0.401  0.288  0.758  2.538
##
## Coefficients:
##   Estimate Std. Error t value Pr(>|t|)
## x   1.2678     0.0297    42.7   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.932 on 99 degrees of freedom
## Multiple R-squared:  0.948,  Adjusted R-squared:  0.948
## F-statistic: 1.82e+03 on 1 and 99 DF,  p-value: <2e-16
```

```
plot(datam$x, datam$y, xlim = c(0, 7), ylim = c(0, 7), type = 'p', xlab = "x", ylab = "y")
abline(lm)
abline(m0, lty = 2)
```



b).

```
sum(m0$residuals)
```

```
## [1] 21.19
```

The sum is not 0.
c).

```
sum(m0$residuals * datam$x)
```

```
## [1] -8.594e-15
```

```
sum(m0$residuals * m0$fitted.values)
```

```
## [1] -4.912e-14
```