Homework 4

Md Kamrul Hasan Khan

April 14, 2017

Answer to the question no 1

```
set.seed(1000)
library(glmnet)
```

```
## Loading required package: Matrix
```

```
## Loading required package: foreach
```

```
## Loaded glmnet 2.0-5
```

```
library(DAAG)
```

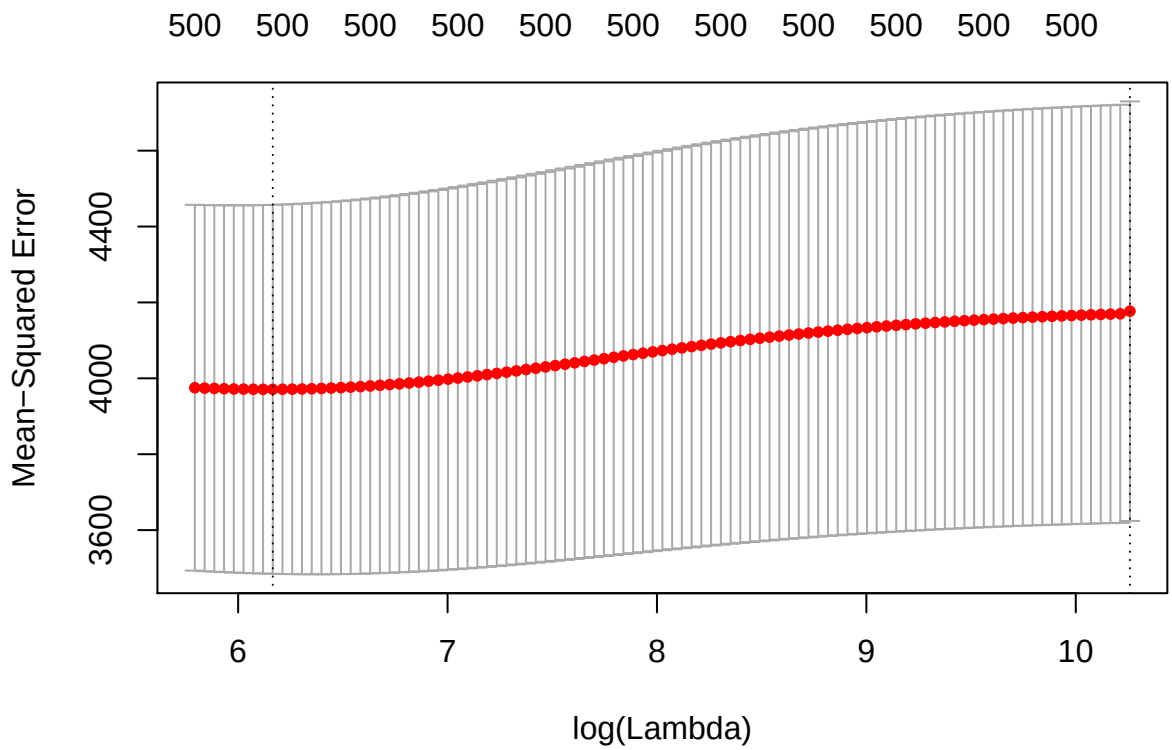
```
## Loading required package: lattice
```

```
n = 100
p = 500
p0 = 150
alpha = seq(0,1, length.out = 100)

x = matrix(rnorm(n*p, 0, 1), nrow = n, ncol = p, byrow = FALSE)

beta = c(rep(5,p0), rep(0, p-p0))
eps = rnorm(n)
fx = x %*% beta
y = fx + eps

train_rows = sample(1:n, n/2)
x_train = x[train_rows,]
x_test = x[-train_rows,]

y_train = y[train_rows,]
y_test = y[-train_rows,]

mse_enet_store = vector( length=length(alpha)-2)
lambda_min = vector( length=length(alpha)-2)

lambda_min_best = vector( length = 3)

for (i in 2: (length(alpha)-1))
{
fit_enet <- cv.glmnet(x_train, y_train, type.measure = "mse",alpha= alpha[i])

lambda_min[i-1] = fit_enet$lambda.min

yhat_enet <- predict(fit_enet, s=fit_enet$lambda.1se, newx = x_test)

mse_enet_store[i-1] <- mean((y_test - yhat_enet)^2)

fit_enet_glm <- glmnet(x_train, y_train, alpha= alpha[i])
```

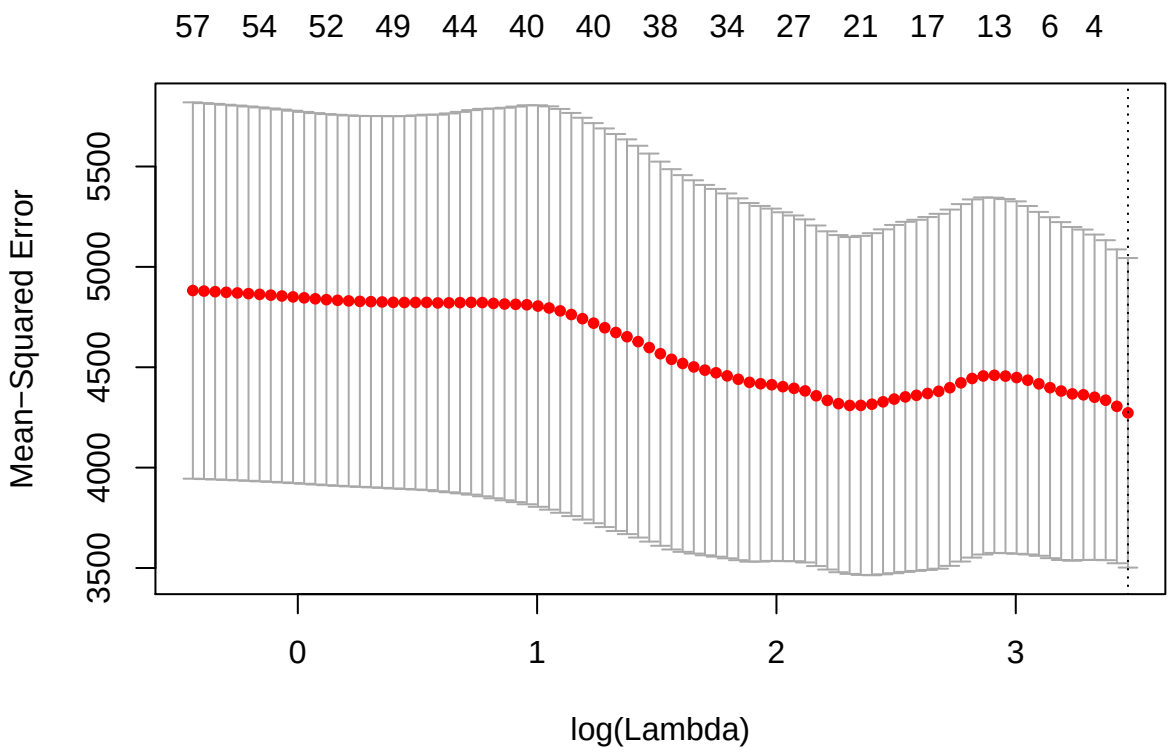
```
}

a0 <-which.min(mse_enet_store)

(alpha_best <- alpha[a0-1])
```

```
## [1] 0.8888889
```

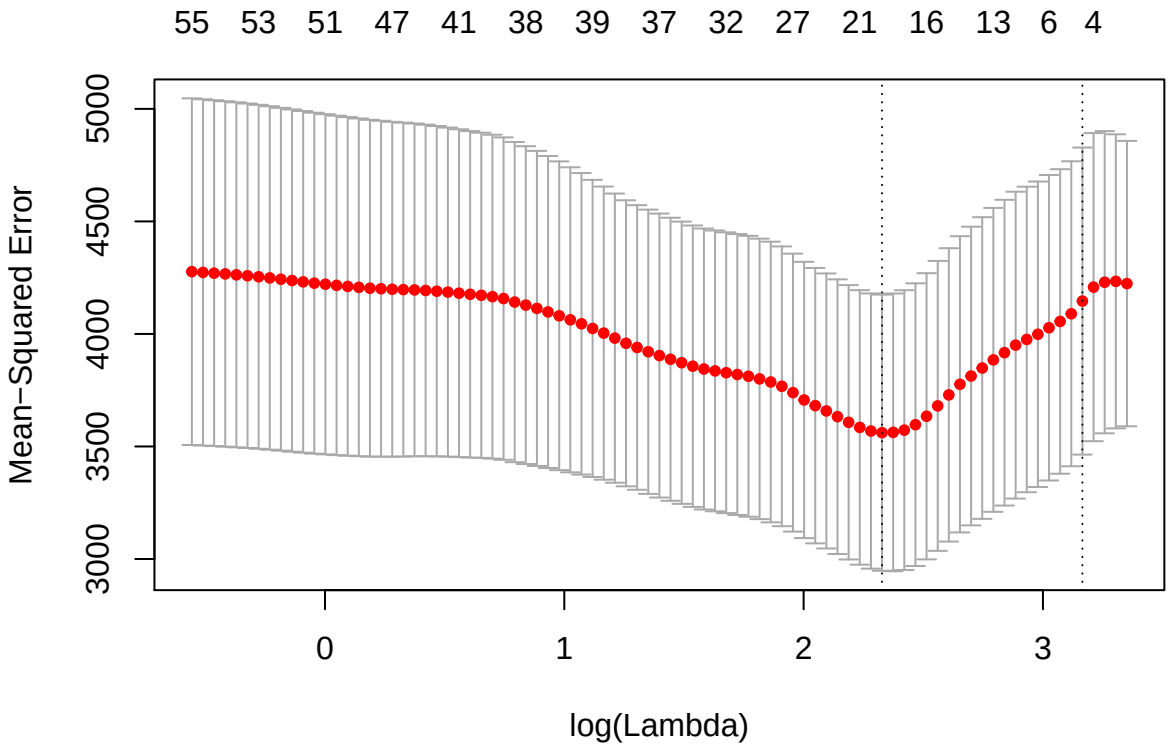
```
fit_ridge <- cv.glmnet(x_train, y_train, type.measure = "dev",alpha= 0)

lambda_min[1] = fit_ridge$lambda.min

plot(fit_ridge)
```



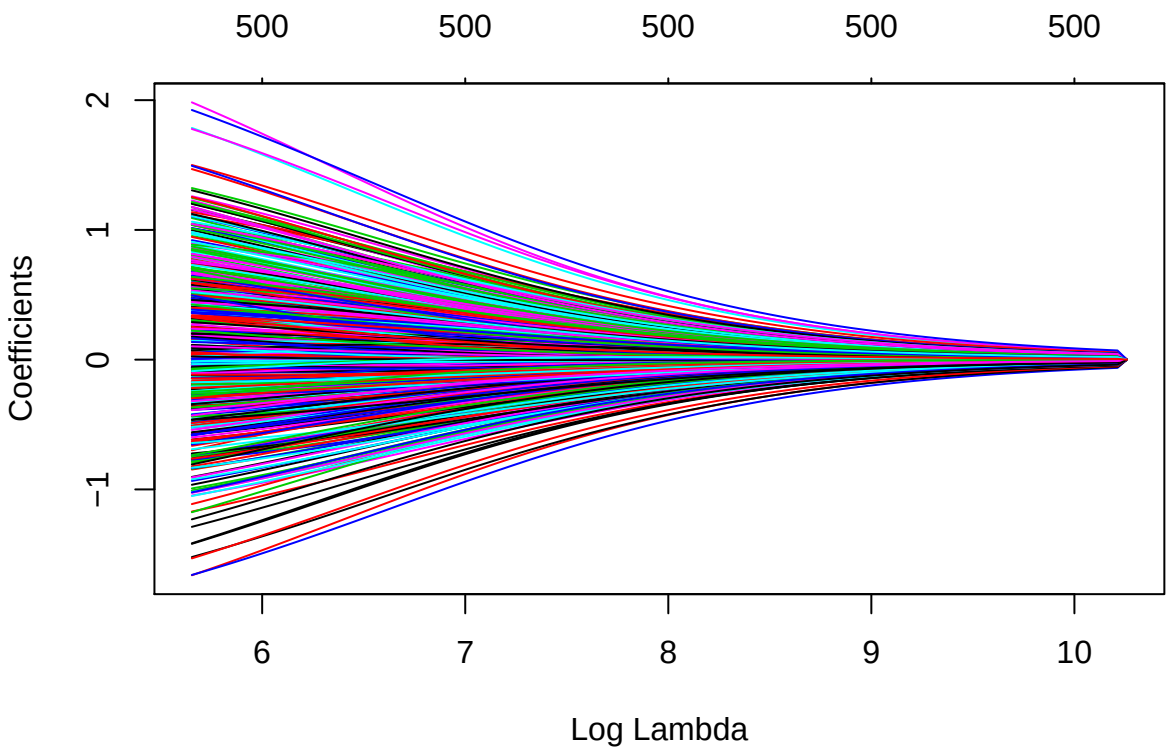

```
fit_enet_best <- cv.glmnet(x_train, y_train, type.measure = "mse",alpha= alpha_best)

lambda_min[2] = fit_enet_best$lambda.min

plot(fit_enet_best)
```



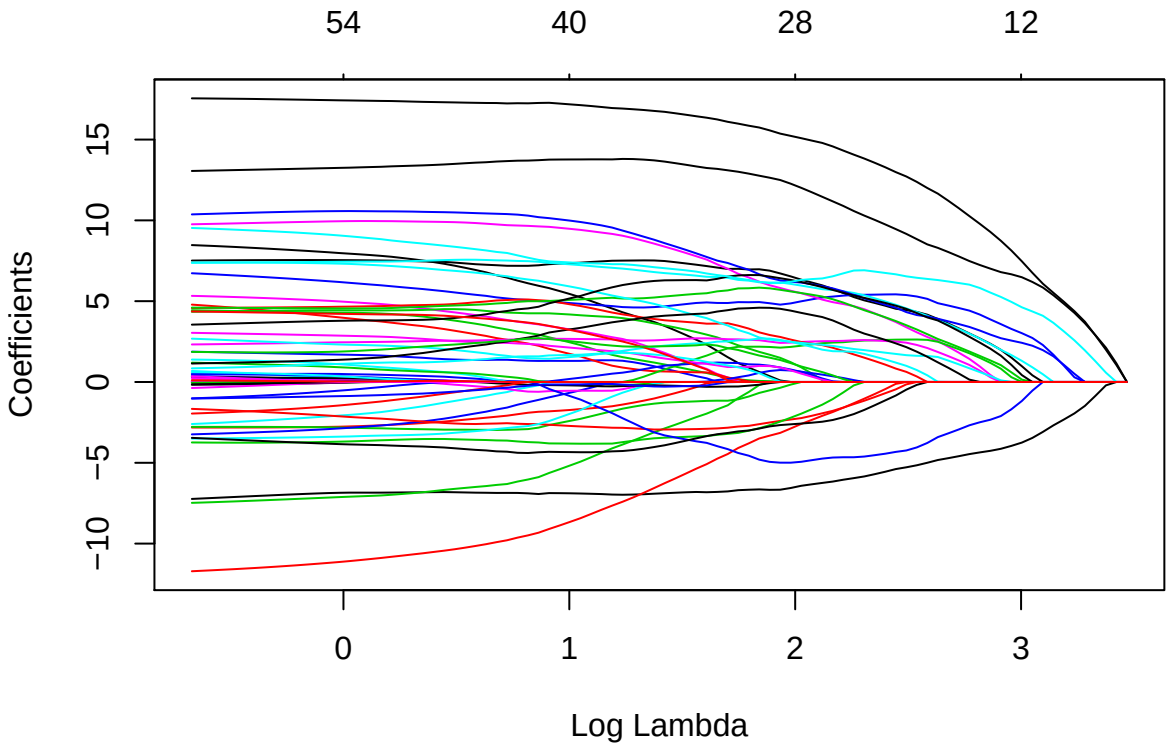

```
fit_lasso <- cv.glmnet(x_train, y_train, type.measure = "mse",alpha= 1)

lambda_min[3] = fit_lasso$lambda.min

plot(fit_lasso)
```



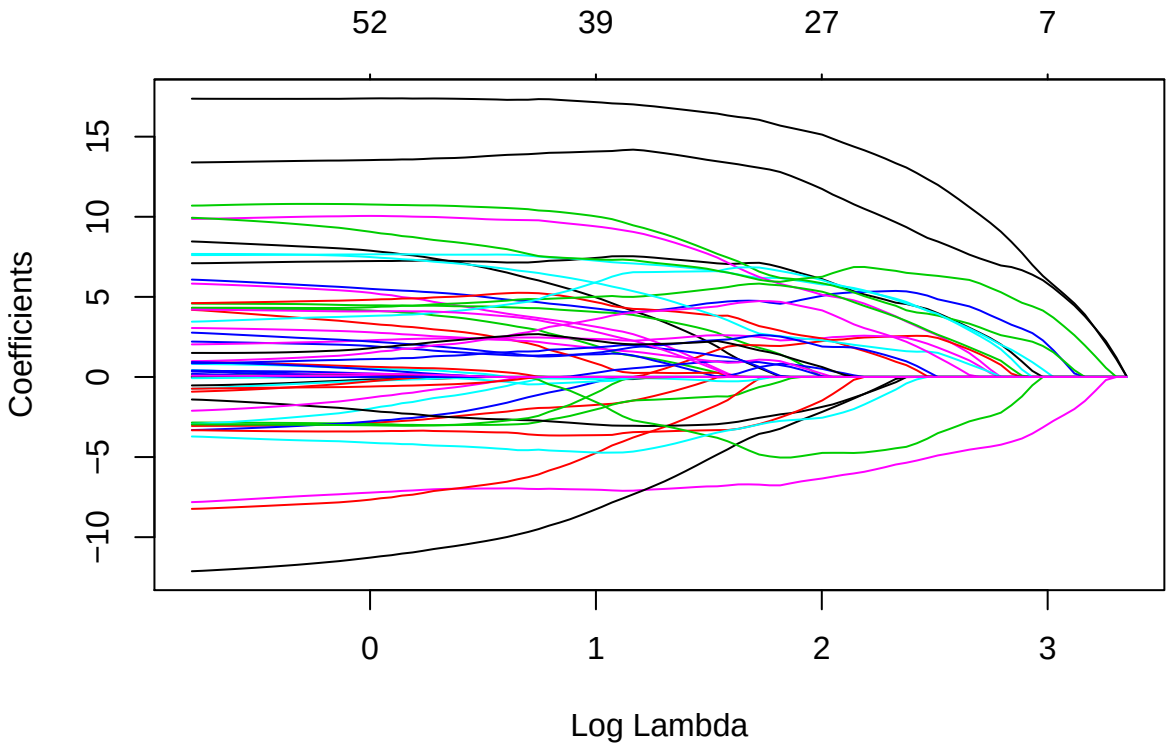

```
fit_redge_glm <- glmnet(x_train, y_train, alpha= 0)

plot(fit_redge_glm, xvar = "lambda")
```




```
fit_enet_glm_best <- glmnet(x_train, y_train, alpha= alpha_best)

plot(fit_enet_glm_best, xvar = "lambda")
```




```
fit_lasso_glm <- glmnet(x_train, y_train, alpha= 1)

plot(fit_lasso_glm, xvar = "lambda")
```



Comments: Here, I have taken a grid of 98 values for Elastic Net and chosen best alpha for which the model has lowest MSE.

I also found the Elastic Net as the best model comparing with Lasso and Ridge because it has lowest MSE.