Practice Final Answers

1.

a. R:

```
# Define the data
target <- c(182, 176, 234, 208)
X1 <- c(92, 94, 104, 113)
X2 <- c(7.5, 7.3, 6.7, 6.2)
# Create the data frame
data <- data.frame(target, X1, X2)
# Fit the linear model
model <- lm(target ~ X1 + X2, data = data)
# Make predictions on the training data
training_predictions <- predict(model, data)
# Predict for new data
new_data <- data.frame(X1 = 93, X2 = 5.5)
new_prediction <- predict(model, new_data)
```

imputed value is 510.65

b.

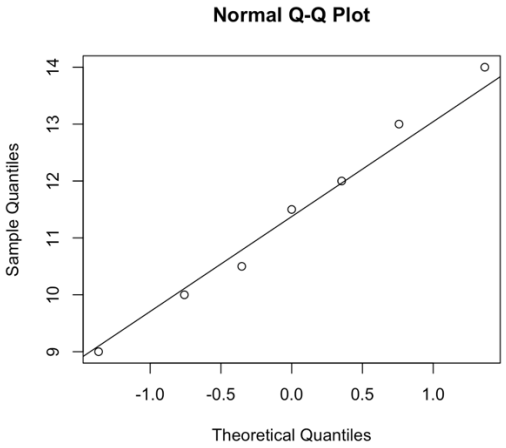
training predictions are 176.2, 193.4, 210.8, 219.6

219.6 is closest to 510.65, therefore we use the actual value of the last sample, 208 as the imputation result

2.

R:

```
# Data
data <- c(9, 10, 10.5, 11.5, 12, 13, 14)
# Create QQ-plot
qqnorm(data)
qqline(data)
```



The qq plot shows the data is roughly normal.

3.
Mean of [1,2,3,4,6,7] = 23/6
Std of [1,2,3,4,6,7] = 2.114
Therefore answer is:
$[(1-23/6)^4+(2-23/6)^4+(3-23/6)^4+(4-23/6)^4+(6-23/6)^4+(7-23/6)^4]/(6*2.114^4) = 1.657$

4.
a. Taking derivative with respect to w_1 and w_2 we have the gradient is:
$[x_1, e^{x2}]^T$
b. plug in the two points, gradient 1 is $[4, 2.7]^T$, gradient 2 is $[3, 7.4]^T$
average is: $[3.5, 5.05]^T$

5.
Squared loss is:
$(5-5.5)^2+(6-6.1)^2+(7-7.9)^2+(8-8.6)^2+(9-9.2)^2=1.47$