Lab 10 Solution

Table 1: Regression Data

y	x1	x2
1.1	11	21
2.0	12	24
2.5	10	26
3.0	14	30

Problem 1

To find the least square estimates (LSE) of linear regression model from the data given in Table 1.

```
## Defining the vectors

# The response vector
y <- c(1.1, 2, 2.5, 3)

# The covariate vectors
x1 <- c(11, 12, 10, 14)
x2 <- c(21, 24, 26, 30)
```

```
## Problem 1: Matrix Method (Closed-Form Solution)

# Creating the X matrix using the given data and adding the intercept manually
X <- cbind (1, x1, x2)

# Closed form solution for the matrix representaion of the linear model
lse_estimates <- solve(t(X) %*% X) %*% (t(X) %*% y)
```

```r
# Displaying the results
lse_estimates
```

```
          [,1]
   -2.69285714
x1 -0.09821429
x2  0.23750000
```

Problem 2

Use the lm() function to calculate the LSE

```r
## Using `lm()` Function

# Using the lm() function
res <- lm(y ~ x1 + x2)

# Displaying the coefficients obtained
res$coefficients
```

```
(Intercept)          x1          x2
-2.69285714 -0.09821429  0.23750000
```

From the above two exercises, we can see that the closed form solution of the matrix representaion of the linear regression model yields the same value of parameters (slopes and intercept) obtained by that using the lm() function.