Lab 10 Solution

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```
Warning in attr(x, "align"): 'xfun::attr()' is deprecated.
Use 'xfun::attr2()' instead.
See help("Deprecated")
```

```
Warning in attr(x, "format"): 'xfun::attr()' is deprecated.
Use 'xfun::attr2()' instead.
See help("Deprecated")
```

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.

```r
## 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)
```

1

```
## 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)

# Displaying the results
lse_estimates
```

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

Problem 2

Use the lm() function to calculate the LSE

```
## 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 represen-
taion of the linear regression model yields the same value of parameters (slopes and intercept)
obtained by that using the lm() function.