Math 3339 Name:

HW #11

(1) In a regression problem with $n = 10$ pairs (x_i, y_i), we find that $\sum x_i = 15$, $\sum y_i = 20$, $\sum x_i y_i = 33$, $\sum x_i^2 = 31.5$, $\sum y_i^2 = 49$.

Find the linear regression model of the data.

(2) The attendance at a racetrack (x) and the amount that was bet (y) over 10 days is given in the following table

Attendance (hundreds)	117	128	122	119	131	135	125	120	130	127
Amount bet (millions)	2.07	2.80	3.14	2.26	3.40	3.89	2.93	2.66	3.33	3.54

(a) Make a scatter plot of y against x

(b) Compute a linear regression model to the data.

(c) Compute the coefficient of determination.

(d) Find a 95% confidence interval for the parameters of the regression model β_0 and β_1.

(e) Test the hypothesis $H_0 : \beta_1 = 0$ against $H_1 : \beta_1 \neq 0$.

(f) Plot the residuals.

(g) Calculate the prediction of a next observation y and $x = 150$, including the prediction interval.

(3) Show that the fitted regression line $\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x$ goes through the point of coordinates $(\bar{x}, \bar{y})$.

(4) Compute the linear regression model of Sales vs Spend using the dataset "hw10-data.csv" available at the homework page.

Note that the predictor (or independent) variable for our linear regression will be Spend and the dependent variable (the one we're trying to predict) will be Sales. Also compute the coefficient of determination.

Hint: to load the data from the csv file, use the R command:

```
dataset = read.csv("hw10-data.csv", header=T, colClasses = c("numeric", "numeric",
"numeric"))
```

(5) A study in a hospital aims to assess factors related to the likelihood that a hospital patients acquires an infection while hospitalized. The variables here are y = infection risk, x_1 = average length of patient stay, x_2 = average patient age:

$$
\begin{aligned}
y &= 4.1, 1.6, 2.7, 5.6, 5.7, 5.1, 4.6, 5.4, 4.3, 6.3 \\
x_1 &= 7.13, 8.82, 8.34, 8.95, 11.2, 9.76, 9.68, 11.18, 8.67, 8.84 \\
x_2 &= 55.7, 58.2, 56.9, 53.7, 56.5, 50.9, 57.8, 45.7, 48.2, 56.3
\end{aligned}
$$

Compute the multiple linear regression model and plot the regression plane.