ed intercept parameter in the
me *INCOME* for the column

$, b_2) = -85.90316$

3.410

.093

he end of the book.

all the parts of this exercise

	$(x-\bar{x})(y-\bar{y})$
$\bar{y}) =$	$\sum(x_i-\bar{x})(y_i-\bar{y}) =$

the last row. What are the

their interpretation.

values show that

$= \sum x_i y_i - N\bar{x}\bar{y}$

ute the fitted values of y, and
sums in the last row.

$\hat{e}_i^2$	$x_i\hat{e}_i$
$\sum \hat{e}_i^2 =$	$\sum x_i\hat{e}_i =$

(e) On graph paper, plot the data points and sketch the fitted regression line $\hat{y}_i = b_1 + b_2 x_i$.

(f) On the sketch in part (e), locate the point of the means $(\bar{x}, \bar{y})$. Does your fitted line pass through that point? If not, go back to the drawing board, literally.

(g) Show that for these numerical values $\bar{y} = b_1 + b_2\bar{x}$.

(h) Show that for these numerical values $\bar{\hat{y}} = \bar{y}$, where $\bar{\hat{y}} = \sum \hat{y}_i / N$.

(i) Compute $\hat{\sigma}^2$.

(j) Compute $\widehat{\text{var}(b_2)}$.

2.2 A household has weekly income \$1000. The mean weekly expenditure on food for households with this income is $E(y|x = \$1000) = \mu_{y|x=\$1000} = \$125$ and expenditures exhibit variance $\text{var}(y|x = \$1000) = \sigma^2_{y|x=\$1000} = 49$.

(a) Assuming that weekly food expenditures are normally distributed, find the probability that a household with this income spends between \$110 and \$140 on food in a week. Include a sketch with your solution.

(b) Find the probability in part (a) if the variance of weekly expenditures is $\text{var}(y|x = \$1000) = \sigma^2_{y|x=\$1000} = 81$.

2.3* Graph the following observations of x and y on graph paper.

x	1	2	3	4	5	6
y	4	6	7	7	9	11

(a) Using a ruler, draw a line that fits through the data. Measure the slope and intercept of the line you have drawn.

(b) Use formulas (2.7) and (2.8) to compute, using only a hand calculator, the least squares estimates of the slope and the intercept. Plot this line on your graph.

(c) Obtain the sample means of $\bar{y} = \sum y_i / N$ and $\bar{x} = \sum x_i / N$. Obtain the predicted value of y for $x = \bar{x}$ and plot it on your graph. What do you observe about this predicted value?

(d) Using the least squares estimates from (b), compute the least squares residuals $\hat{e}_i$. Find their sum.

(e) Calculate $\sum x_i \hat{e}_i$.

2.4 We have defined the simple linear regression model to be $y = \beta_1 + \beta_2 x + e$. Suppose however that we knew, for a fact, that $\beta_1 = 0$.

(a) What does the linear regression model look like, algebraically, if $\beta_1 = 0$?

(b) What does the linear regression model look like, graphically, if $\beta_1 = 0$?

(c) If $\beta_1 = 0$ the least squares "sum of squares" function becomes $S(\beta_2) = \sum_{i=1}^{N}(y_i - \beta_2 x_i)^2$. Using the data,

x	1	2	3	4	5	6
y	4	6	7	7	9	11

plot the value of the sum of squares function for enough values of β_2 for you to locate the approximate minimum. What is the significance of the value of β_2 that minimizes $S(\beta_2)$? (*Hint*: Your computations will be simplified if you