

Name: _____

Notesheet. Section 8.4+8.7: The Method of Least Squares + Double Integrals

Math 1220

Definition 1. Given n data points $(x_1, y_1), \dots, (x_n, y_n)$, a scatter diagram is

Definition 2. The principle of least squares states that the straight line L that fits n data points best is

The line L obtained in this manner is called the least-squares line, or regression line.

Theorem 3. Given n data points $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$, then the least squares (regression) line for the data is given by the linear equation

$$y = f(x) = mx + b$$

where the constants m and b satisfy the equations

$$\left\{ \begin{array}{l} \\ \\ \\ \\ \\ \end{array} \right.$$

You will see why this is true in homework.

Challenge 4. The following data consists of the quiz grades for five students

Student	Quiz 1 Grade	Quiz 2 grade
1	$x_1 = 1$	$y_1 = 1$
2	$x_2 = 2$	$y_2 = 3$
3	$x_3 = 3$	$y_3 = 4$
4	$x_4 = 4$	$y_4 = 3$
5	$x_5 = 5$	$y_5 = 6$

Challenge 5. Evaluate the following integrals by integrating with respect to the appropriate variable and treating the other variable as a constant.

(a) $\int_0^1 xy^2 dx$

(b) $\int_0^x (x + y) dy$

(c) $\int_1^2 \frac{x}{y^2} e^{x/y} dy$

Challenge 6. Now, evaluate the iterated integrals by doing the inside integral and then the outside integral.

(a) $\int_0^1 \int_0^1 xy^2 dx dy$

(b) $\int_0^1 \int_0^x (x + y) dy dx$

(c) $\int_0^x \int_0^1 (x + y) dx dy$