2. Relationship is transcendental
3. Relationship is polynomial
4. Relationship involves two or more independent variables

10.2 FITTING LINEAR EQUATIONS

Fitting a straight line is the simplest approach of regression analysis. Let us consider the mathematical equation for a straight line

$$y = a + bx = f(x)$$

to describe the data. We know that a is the intercept of the line and b its slope. Consider a point (x_i, y_i) as shown in Fig. 10.2. The vertical distance of this point from the line $f(x) = a + bx$ is the error q_i. Then,

$$\begin{aligned} q_i &= y_i - f(x_i) \\ &= y_i - a - bx_i \end{aligned} \tag{10.1}$$

There are various approaches that could be tried for fitting a "best" line through the data. They include:

1. Minimise the sum of errors, i.e., minimise

$$\sum q_i = \sum (y_i - a - bx_i) \tag{10.2}$$

2. Minimise the sum of absolute values of errors

$$\sum |q_i| = \sum |(y_i - a - bx_i)| \tag{10.3}$$

3. Minimise the sum of squares of errors

$$\sum q_i^2 = \sum (y_i - a - bx_i)^2 \tag{10.4}$$