Consider an equation in the form

$$F(x, y) = 0 \tag{2.3.1}$$

where F is a function of two variables. The set of all ordered pairs (x, y) satisfying (2.3.1) is called the *graph* of (2.3.1). That is, the graph is the following subset of $\mathbb{R}^2$:

$$\{(x, y) \in \mathbb{R}^2 : F(x, y) = 0\}.$$

Since ordered pairs can be considered as points in the coordinate plane, the graph can be considered as a subset of the plane.

Example Consider the following equation

$$2x + 3y - 4 = 0.$$

(1) Since $2(2) + 3(0) - 4 = 0$, the point (ordered pair) $P(2, 0)$ belongs to the graph of the equation.

(2) Since $2(-1) + 3(2) - 4 = 0$, point $Q(-1, 2)$ belongs to the graph of the equation.

(3) Since $2(1) + 3(2) - 4 = 4 \neq 0$, the point $R(1, 2)$ does not belong to the graph.

Remark The graph of the equation is the line passing through P and Q.

Definition An *x-intercept* (respectively a *y-intercept*) of the graph of an equation $F(x, y) = 0$ is a point where the graph intersects the x-axis (respectively the y-axis).

Example The graph of the equation

$$2x + 3y - 4 = 0 \tag{2.3.2}$$

is a line. Its x-intercept is $(2, 0)$ and its y-intercept is $(0, \frac{4}{3})$. These are obtained by putting $y = 0$ and $x = 0$ respectively into (2.3.2).

Example The graph of the equation

$$x^2 + y^2 = 1$$

is a circle centered at the origin $(0, 0)$ with radius 1.

The graph has two x-intercepts, namely $(1, 0)$ and $(-1, 0)$ and two y-intercepts, namely, $(0, 1)$ and $(0, -1)$.

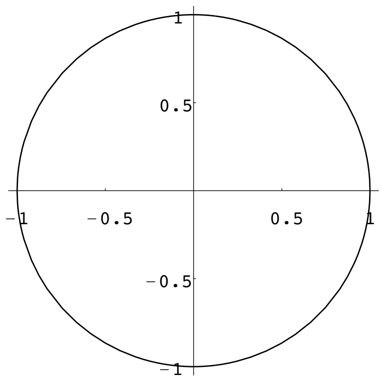

Figure 2.5

Example Find the x-intercept(s) and y-intercept(s) of the graph of

$$y = x^2 - 5x + 6 \tag{2.3.3}$$

Solution To find the x-intercepts, we put $y = 0$ in (2.3.3). Solving

$$\begin{aligned} 0 &= x^2 - 5x + 6 \\ 0 &= (x - 2)(x - 3) \end{aligned}$$