Q13 : Find two numbers whose sum is 24 and whose product is as large as possible.

Answer :

Let one number be x. Then, the other number is (24 - x).

Let $P(x)$ denote the product of the two numbers. Thus, we have:

$$P(x) = x(24 - x) = 24x - x^2$$

$$\therefore P'(x) = 24 - 2x$$

$$P''(x) = -2$$

Now,

$$P'(x) = 0 \Rightarrow x = 12$$

Also,

$$P''(12) = -2 < 0$$

∴By second derivative test, x = 12 is the point of local maxima of P. Hence, the product of the numbers is the maximum when the numbers are 12 and 24 - 12 = 12.