72. Using Rolle's theorem, find the point on the curve $y = x(x - 4), x \in [0, 4]$, where the tangent is parallel to x-axis.

Sol. We have, $y = x(x - 4), x \in [0, 4]$

Since given function is polynomial it is continuous and differentiable.

Also $y(0) = y(4) = 0$

So, conditions of Rolle's theorem are satisfied.

Hence there exists a point $c \in (0, 4)$ such that

$$f'(c) = 0$$

$$\Rightarrow \quad 2c - 4 = 0$$

$$\Rightarrow \quad c = 2$$

$$\Rightarrow \quad x = 2 \text{ and } y(2) = 2(2 - 4) = -4$$

Therefore, the required point on the curve, where the tangent drawn is parallel to the x–axis is $(2, -4)$.