

In this question we shall consider the function $f(x)$ defined by

$$f(x) = x^2 - 2px + 3$$

where p is a constant.

(i) Show that the function $f(x)$ has one stationary value in the range $0 < x < 1$ if $0 < p < 1$, and no stationary values in that range otherwise.

In the remainder of the question we shall be interested in the smallest value attained by $f(x)$ in the range $0 \leq x \leq 1$. Of course, this value, which we shall call m , will depend on p .

(ii) Show that if $p \geq 1$ then $m = 4 - 2p$.

(iii) What is the value of m if $p \leq 0$?

(iv) Obtain a formula for m in terms of p , valid for $0 < p < 1$.

(v) Using the axes opposite, sketch the graph of m as a function of p in the range $-2 \leq p \leq 2$.