

## STEP II, 2004, Q2

- 2 Prove that, if  $|\alpha| < 2\sqrt{2}$ , then there is no value of  $x$  for which

$$x^2 - \alpha|x| + 2 < 0. \quad (*)$$

Find the solution set of (\*) for  $\alpha = 3$ .

For  $\alpha > 2\sqrt{2}$ , the sum of the lengths of the intervals in which  $x$  satisfies (\*) is denoted by  $S$ . Find  $S$  in terms of  $\alpha$  and deduce that  $S < 2\alpha$ .

Sketch the graph of  $S$  against  $\alpha$ .



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