

STEP II, 2002, Q4

- 4 Give a sketch to show that, if $f(x) > 0$ for $p < x < q$, then $\int_p^q f(x) dx > 0$.
- (i) By considering $f(x) = ax^2 - bx + c$ show that, if $a > 0$ and $b^2 < 4ac$, then $3b < 2a + 6c$.
- (ii) By considering $f(x) = a \sin^2 x - b \sin x + c$ show that, if $a > 0$ and $b^2 < 4ac$, then $4b < (a + 2c)\pi$.
- (iii) Show that, if $a > 0$, $b^2 < 4ac$ and $q > p > 0$, then

$$b \ln(q/p) < a \left(\frac{1}{p} - \frac{1}{q} \right) + c(q - p).$$



NextStepMaths.com

To view mark schemes, fully worked solutions and examiner's comments, and for more details about tutoring and other services offered, go to NextStepMaths.com



NextStepMaths.com

To view mark schemes, fully worked solutions and examiner's comments, and for more details about tutoring and other services offered, go to [NextStepMaths.com](https://www.NextStepMaths.com)