



## STEP III, 2002 Q3

3 Let

$$f(x) = a\sqrt{x} - \sqrt{x-b},$$

where  $x \geq b > 0$  and  $a > 1$ . Sketch the graph of  $f(x)$ . Hence show that the equation  $f(x) = c$ , where  $c > 0$ , has no solution when  $c^2 < b(a^2 - 1)$ . Find conditions on  $c^2$  in terms of  $a$  and  $b$  for the equation to have exactly one or exactly two solutions.

Solve the equations (i)  $3\sqrt{x} - \sqrt{x-2} = 4$  and (ii)  $3\sqrt{x} - \sqrt{x-3} = 5$ .



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