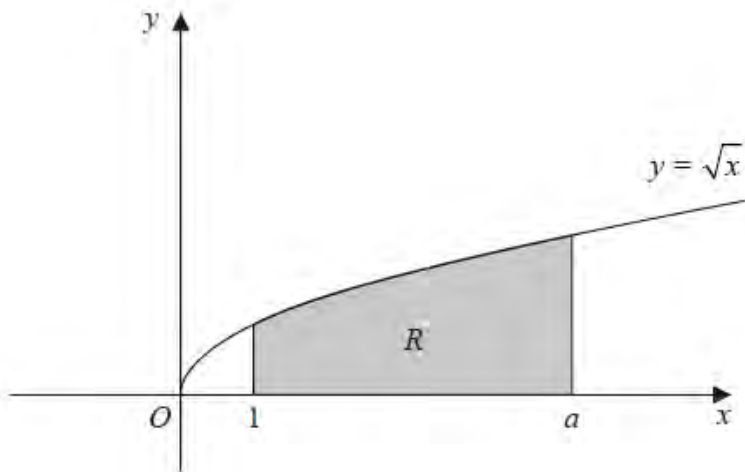**8.**

Figure 2

Figure 2 shows a sketch of the curve with equation $y = \sqrt{x}$, $x \geq 0$.

The region R, shown shaded in Figure 2, is bounded by the curve, the line with equation $x = 1$, the x-axis and the line with equation $x = a$, where a is a constant.

Given that the area of R is 10,

(*a*) find, in simplest form, the value of

(i) $\displaystyle\int_{1}^{a} \sqrt{8x} \ dx$,

(ii) $\displaystyle\int_{0}^{a} \sqrt{x} \ dx$,

(4)

(*b*) show that $a = 2^{k}$, where k is a rational constant to be found.

(4)

(Total for Question 8 is 8 marks)