

1. Find the value of the constant k , $0 < k < 9$, such that

$$\int_k^9 \frac{6}{\sqrt{x}} dx = 20$$

(4)

$$\int_k^9 \frac{6}{\sqrt{x}} dx = \int_k^9 6x^{-1/2} dx = 20$$

$$= \left[12x^{1/2} \right]_k^9 = 20 \quad (1)$$

$$= 12 \times \sqrt{9} - 12\sqrt{k} = 20$$

$$= 12 \times 3 - 12\sqrt{k} = 20$$

$$12\sqrt{k} = 36 - 20 \quad (1)$$

$$\sqrt{k} = \frac{16}{12} = \frac{4}{3} \quad (1)$$

$$k = \frac{16}{9} \quad (\text{as } 0 < k < 9)$$

(1)