

The area of the region bounded by the graph of the function  $f(x)=\frac{4}{P(1+x^2)}$ , the x-axis, the line  $x = \frac{P}{3}$  and the line  $x = a$  is 2 square units. Find the exact value of a.

$$f(x)=\frac{4}{P(1+x^2)}$$

$$f'(x)=-\frac{8Px}{(P+Px^2)^2}$$

$$f(0)=\frac{4}{P(1+0)}=\frac{4}{P}$$

$$\begin{aligned} S[\frac{P}{3};a](\frac{4}{P(1+x^2)})dx &= \\ &= \frac{4}{P} * S[\frac{P}{3};a](\frac{1}{(1+x^2)})dx = \\ &= \frac{4}{P}(\arctg x)|[\frac{P}{3};a] = \\ &= \frac{4}{P}(\arctg a - \arctg \frac{P}{3}) = \\ &= \frac{4}{P} * (\arctg a - \arctg \frac{P}{3}) = 2 \end{aligned}$$

$$\begin{aligned} \frac{4}{P} \arctg a &= \frac{4}{P} \arctg \frac{P}{3} - 2 \\ \arctg a &= (\frac{4}{P} \arctg \frac{P}{3} - 2) / \frac{4}{P} \\ a &= \text{tg}((\frac{4}{P} \arctg \frac{P}{3} - 2) / \frac{4}{P}) \end{aligned}$$

