8 The surface area of an object, A cm^2, is given by $A = 300x - \left(\frac{\pi + 4}{8}\right)x^2$. Given that x cm can vary, find the stationary value of A and determine whether it is a maximum or minimum. [5]

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$A = 300x - \left(\frac{\pi+4}{8}\right)x^2$ → graph below

$\frac{dA}{dx} = 300 - \frac{2(\pi+4)}{8}x$

$= 300 - \frac{\pi+4}{4}x$ → gradient

At stationary A, $\frac{dA}{dx} = 0$

$300 - \frac{\pi+4}{4}x = 0$

$x = \frac{1200}{\pi+4}$

$= 168$ (3 s.f)

$\frac{d^2A}{dx^2} = \frac{-\pi-4}{4} < 0$

Thus when $x = 168.0297...$,

Maximum $A = 300(168.0297...) - \frac{\pi+4}{8}(168.0297...)^2$

$= 25204.461...$

$= 25200$ (3 s.f)

Extra info: max pt

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