Differentiation

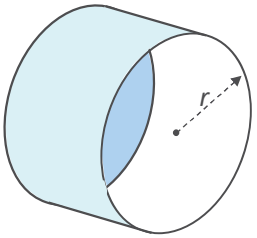
1. [C1] Calculate $f'(4)$ given that $f(x) = \frac{2x^2-2}{\sqrt{x}}$.

2. [C2] Determine the equation of the tangent to the curve $y = x^3 - 4x^2 + 11$ at the point where $x = 2$.

3. [C4] Determine the coordinates and nature of the stationary points on the curve with equation $y = x^3 + 5x^2 - 8x + 1$

4. [C8] Given $h(t) = 3t(t^2 - 1)$, determine the rate of change of h when t = 5.

5. [C7] A small open cylindrical glass container has a radius of *r* cm as shown in the diagram.

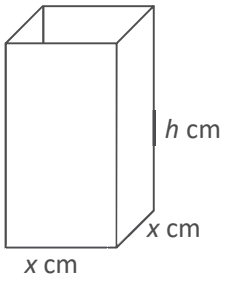


The total surface area (*A*), expressed in terms of *r*, is found to be

$$A(r) = \frac{80}{r} + \pi r^2$$

Find the radius of the cylinder so that the surface area (*A*) is at a minimum.
Give your answer correct to 2-decimal places.

6. [C7] The diagram shows an open top box with a square base of *x* cm and height *h* cm.



The box has to be made from 660 cm^2 of card.

(a) Show clearly that the volume of the box, in terms of *x*, can be expressed as:

$$V(x) = 165x - \frac{1}{4}x^3$$

(b) Hence, or otherwise, find the value of *x*, so that the volume is a maximum, leaving your answer as a surd in its simplest form.
Justify your answer.