Applied Differentiation Problems

(a) A rectangle has a width x cm and a length $(30 - 2x)$ cm. Using calculus, find the maximum area of the rectangle.
(b) A car sales company sells x cars per week. Its revenue R per week is given by the equation $R = 0.2x^2 - 10x + 1750$. Using differentiation, find the number of cars which generates the maximum revenue, and the value of this revenue.

(a) The cost C of a car journey when driving at a speed of x mph is given by $C = \frac{720}{x} + 0.2x + 6$. Using differentiation, find the value of x that minimises the cost, and the minimum value of C.
(b) The volume of a box is given by $V = x(5 - x)^2$. Use calculus to find the maximum volume of the box, and the value of x for which this occurs.

(a) A picture frame has a perimeter of 120 cm. If the width of the frame is x cm, then show that the height of the frame is $(60 - x)$ cm. Hence use calculus to find the value of x that gives a maximum area for the frame. Calculate this maximum area.
(b) A farmer has enough stone for 80 m of dry stone walling. He wants to create a field with the largest area possible. Find the dimensions of the field that gives this maximum area.

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