Name:

GCSE Further Maths

Optimising Problems

Corbettmaths

Ensure you have: Pencil, Pen, Calculator

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Revision for this topic

www.corbettmaths.com/gcse-further-maths

1. A farmer creates a pen for his chickens.

The width of the field is x metres.
The perimeter of the field is 100 metres.

(a) Show that the length of the rectangle is $50 - x$ metres

(1)

(b) Show that the area of the field is $A = 50x - x^2$

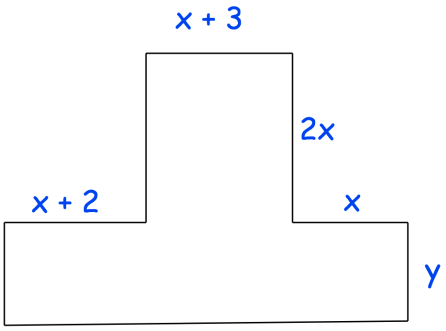
(1)

(c) Find the value of x for which A is a maximum and show it is a maximum.

.....

(5)

2. The shape below is made from two rectangle.



The perimeter of the shape is 100cm.

(a) Show that $y = 45 - 5x$

(2)

The area of the shape is $A cm^2$

(b) Show that $A = 225 + 116x - 13x^2$

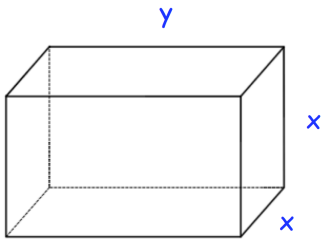
(2)

(c) Find the value of x for which A is a maximum and show it is a maximum.

.....

(5)

3. Shown below is a metal box in the shape of a cuboid.



The volume of the box is 80cm³

(a) Show that $y = \frac{80}{x^2}$

(2)

(b) Show that the area of metal to make the box is given by

$$A = 2x^2 + \frac{320}{x}$$

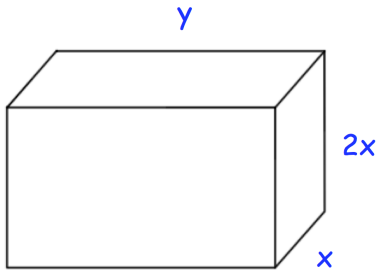
(2)

(c) Find the value of x for which A is a minimum, and show it is a minimum.

.....

(6)

4. Shown below is a cuboid



The surface area of the cuboid is 120cm².

(a) Show that $y = \frac{20}{x} - \frac{2x}{3}$

(3)

(b) Show that the volume of the cuboid is given by

$$V = 40x - \frac{4}{3}x^3$$

(2)

(c) Find the value of x for which V is a maximum, and show it is maximum.

.....

(5)

(d) Use your answer to (c) to find the maximum volume of the cuboid

.....cm²

(2)

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5. The volume of a container with a height of x, is given by

$$V = x(x-1)(9-x) \quad \text{where } 1 < x < 9$$

(a) Find $\frac{dV}{dx}$

.....

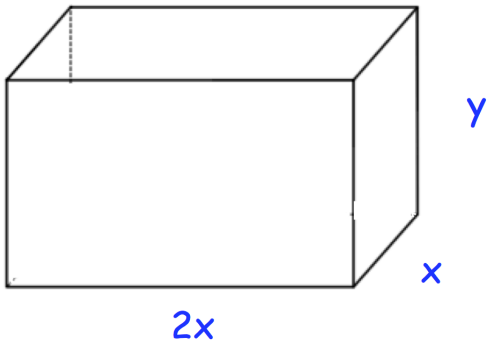
(3)

(b) Hence find the value of x for which the volume is a maximum.
Give your answer to 1 decimal place.

.....

(3)

6. An open-topped tank in the shape of a cuboid is shown below.



The surface area of the cuboid is 300cm²

(a) Show that $y = \frac{50}{x} - \frac{x}{3}$

(3)

(b) Show that the volume of the tank is $V = 100x - \frac{2}{3}x^3$

(3)

(c) Find the value of x for which V is a maximum

.....

(3)

(d) Show the answer is (c) is a maximum.

(2)

(e) Find the maximum volume of the tank

.....

(2)