

Curves

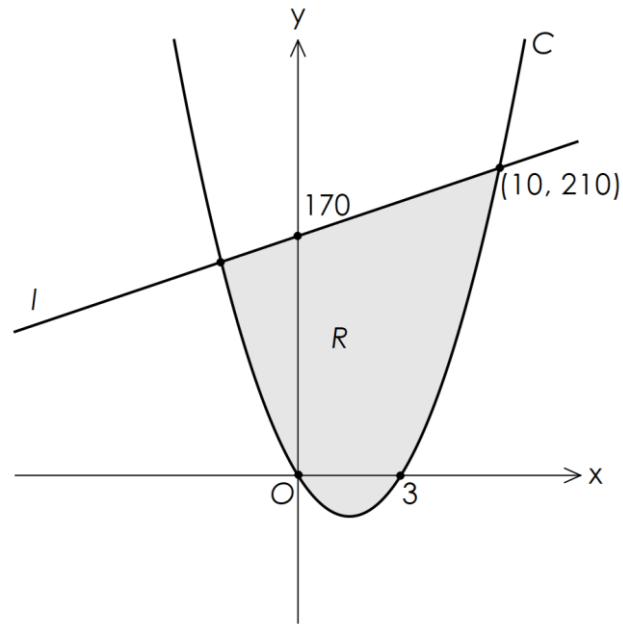


Figure 1

Figure 1 shows a sketch of curve C and a straight line l .

Given that

- C has equation $y = f(x)$ where $f(x)$ is a quadratic expression in x
- C cuts the x -axis at 0 and 3
- l cuts the y -axis at 170 and intersects C at the point $(10, 210)$

use inequalities to define the region R shown shaded in Figure 1.

(5 marks)

Begin by finding the equation of the line l , starting with the gradient:

$$\text{gradient of } l = \frac{210 - 170}{10} = 4$$

and use the y -intercept = 170

1 mark

which gives:

$$y = 4x + 170$$

1 mark

The roots of the equation for C are $x = 0$ and $x = 3$, which means that the equation for C is of the form:

$$y = ax(x - 3)$$

1 mark

where a is to be found.

Substituting in the coordinates $(10, 210)$ gives:

$$210 = 10a(10 - 3) \Rightarrow 70a = 210 \Rightarrow a = 3$$

which gives:

$$y = 3x(x - 3)$$

1 mark

So the resulting inequality is:

$$3x(x - 3) \leq y \leq 4x + 170$$

1 mark