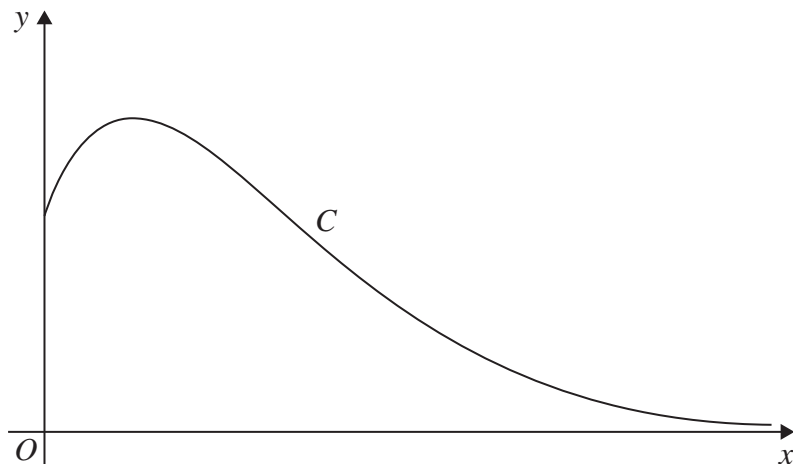**9.**

Figure 3

In this question you must show all stages of your working.
Solutions relying entirely on calculator technology are not acceptable.

Figure 3 shows the curve C with equation

$$y = \frac{1}{x^x} \qquad x > 0$$

(a) Show that the equation of C can be written as

$$\ln y = -x \ln x$$

(2)

(b) Hence show that

$$\frac{\mathrm{d}y}{\mathrm{d}x} = -x^{-x}(\ln x + 1)$$

(3)

(c) Find the exact coordinates of the stationary point of C

(3)

The function g is defined by

$$g(x) = \frac{1}{x^x} \qquad x > 0$$

(d) Deduce the range of g

(2)