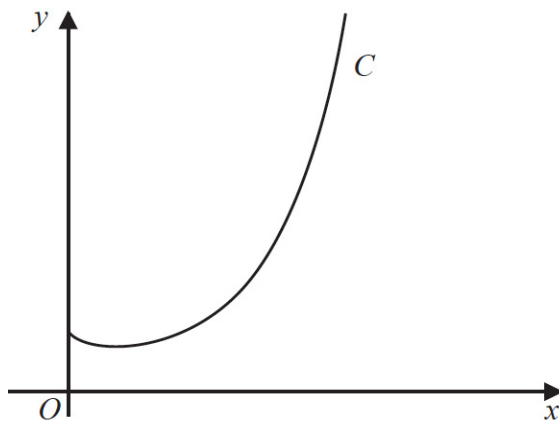


11.



**Figure 8**

Figure 8 shows a sketch of the curve  $C$  with equation

$$y = x^x, \quad x > 0.$$

(a) Find, by firstly taking logarithms, the  $x$  coordinate of the turning point of  $C$ .

(Solutions based entirely on graphical or numerical methods are not acceptable.)

(5)

The point  $P(\alpha, 2)$  lies on  $C$ .

(b) Show that  $1.5 < \alpha < 1.6$ .

(2)

A possible iteration formula that could be used in an attempt to find  $\alpha$  is

$$x_{n+1} = 2x_n^{1-x_n}.$$

Using this formula with  $x_1 = 1.5$ ,

(c) find  $x_4$  to 3 decimal places,

(2)

(d) describe the long-term behaviour of  $x_n$ .

(2)

**(Total for Question 11 is 11 marks)**