

4.

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

(i) Given that

$$y = a^x \quad \text{where } a \text{ is a positive constant}$$

express, in simplest form, in terms of y and a

(a) a^{3x+1}

(1)

(b) $\frac{5}{(3a^{1-x})^{-2}}$

(3)

(ii) (a) Use the substitution $p = 9^t$ to show that the equation

$$3(3^{4t+2} + 1) = 82 \times 9^t$$

can be rewritten as

$$27p^2 - 82p + 3 = 0$$

(2)

(b) Hence solve

$$3(3^{4t+2} + 1) = 82 \times 9^t$$

(3)

7. (a) Sketch the graph of the curve C with equation

$$y = \frac{4}{x - k}$$

where k is a positive constant.

Show on your sketch

- the coordinates of any points where C cuts the coordinate axes
- the equation of the vertical asymptote to C

(4)

Given that the straight line with equation $y = 9 - x$ does not cross or touch C (b) find the range of values of k .

(5)

1. Given that

$$p = \frac{1}{16}x^4 \quad q = \frac{40}{x^3}$$

express each of the following in the form kx^n where k and n are fully simplified constants.

(a) $p^{\frac{1}{2}}$

(1)

(b) $(pq)^{-1}$

(2)

(c) pq^2

(2)

6.

In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

(a) Sketch the curve C with equation

$$y = \frac{1}{2-x} \quad x \neq 2$$

State on your sketch

- the equation of the vertical asymptote
- the coordinates of the intersection of C with the y -axis

(3)

The straight line l has equation $y = kx - 4$, where k is a constant.

Given that l cuts C at least once,

(b) (i) show that

$$k^2 - 5k + 4 \geq 0$$

(ii) find the range of possible values for k .

(6)