Topic : Differentiation/Stationary points / Quartic Graphs

Figure 2

$$f(x) = x^4 + \frac{1}{3}x^3 - 8x^2 + ax + \frac{17}{3}$$

where *a* is a constant.

Figure 2 shows a sketch of the curve *C* with equation $y = f(x)$

Given that *C* has a local maximum at $x = -\frac{1}{4}$

(a) show that $a = -4$

(4)

(b) find the exact *y* coordinate of the local maximum.

(1)

The equation $f(x) = k$, where *k* is a constant, has 4 distinct solutions.

(c) Using algebra and showing all stages of your working, find the range of values of *k*.

Give the answer using set notation.

(Solutions relying on calculator technology are not acceptable.)

(4)

(Total for question = 9 marks)