**4.** $f(x) = (x - 2)(2x^2 + 5x + k) + 21$

where $k$ is a constant.

(a) State the remainder when $f(x)$ is divided by $(x - 2)$

**(1)**

Given that $(2x - 1)$ is a factor of $f(x)$

(b) show that $k = 11$

**(2)**

(c) Hence

(i) fully factorise $f(x)$,

(ii) find the number of real solutions of the equation

$$f(x) = 0$$

giving a reason for your answer.

**(5)**

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**Question 4 continued**

**Question 4 continued**

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**Question 4 continued**

**(Total for Question 4 is 8 marks)**

**5.** **In this question you must show detailed reasoning.**

(a) Given that $x$ and $y$ are positive numbers such that

$$(x-y)^3 > x^3 - y^3$$

prove that

$$y > x$$

**(4)**

(b) Using a counter example, show that the result in part (a) is not true for all real numbers.

**(2)**

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