

**9** A function  $f$  is defined for all real values of  $x$  as

$$f(x) = x^4 + 5x^3$$

The function has exactly two stationary points when  $x = 0$  and  $x = -\frac{15}{4}$

**9 (a) (i)** Find  $f''(x)$

**[2 marks]**

**9 (a) (ii)** Determine the nature of the stationary points.

Fully justify your answer.

**[4 marks]**

**9 (b)** State the range of values of  $x$  for which

$$f(x) = x^4 + 5x^3$$

is an increasing function.

**[1 mark]**

**9 (c)** A second function  $g$  is defined for all real values of  $x$  as

$$g(x) = x^4 - 5x^3$$

**9 (c) (i)** State the single transformation which maps  $f$  onto  $g$ .

**[1 mark]**

**9 (c) (ii)** State the range of values of  $x$  for which  $g$  is an increasing function.

**[1 mark]**