6 The two functions, f and g, are defined for all values of x as

$$f : x \mapsto 3x + 1$$

$$g : x \mapsto x^2 - 2$$

(a) Find (i) $g(-3)$ (ii) $fg(1)$

(2)

(b) Write down the range of g

(1)

(c) Express the composite function gf in the form $gf : x \mapsto \ldots$

(1)

The function h is defined as

$$h : x \mapsto \frac{2x - 1}{x + 3} \quad \text{where } x \neq -3$$

(d) Solve the equation $h(x) = 1$

(2)

(e) (i) Express the inverse function h^{-1} in the form $h^{-1} : x \mapsto \ldots$

(ii) Write down the value of x that must be excluded from the domain of h^{-1}

(4)

(f) Find the exact values of p for which

$$4gf(p) = fh^{-1}(1)$$

Show your working clearly.

Give your values in the form $\frac{a \pm \sqrt{b}}{c}$ where a, b and c are integers.

(3)

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$$\left[\text{Solutions of } ax^2 + bx + c = 0 \text{ are } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\right]$$

Question 6 continued

Question 6 continued

Question 6 continued

(Total for Question 6 is 13 marks)