SSS2 FURTHER MATH HOLIDAY ASSIGNMENT

1 **(a)** **(i)** Use the binomial theorem to expand $(1+3x)^7$ in ascending powers of x, as far as the term in x^3. Simplify each term. [2]

   (ii) Show that your expansion from **part (i)** gives the value of 1.03^7 as 1.23 to 2 decimal places. [2]

   (b) Find the term independent of x in the expansion of $\left(\dfrac{x^4}{2}+\dfrac{2}{x}\right)^{15}$. [2]

2 **(a)** It is given that
$$f : x \rightarrow 2x^2 \text{ for } x \geqslant 0,$$
$$g : x \rightarrow 2x+1 \text{ for } x \geqslant 0.$$

Each of the expressions in the table can be written as one of the following.

$$f' \quad f'' \quad g' \quad g'' \quad fg \quad gf \quad f^2 \quad g^2 \quad f^{-1} \quad g^{-1}$$

Complete the table. The first row has been completed for you. [5]

Expression	Function notation
2	g'
0	
$4x$	
$8x^2+8x+2$	
$4x+3$	
$\dfrac{x-1}{2}$	

   (b) It is given that $h(x) = (x-1)^2 + 3$ for $x \geqslant a$. The value of a is as small as possible such that h^{-1} exists.

   (i) Write down the value of a. [1]

   (ii) Write down the range of h. [1]

   (iii) Find $h^{-1}(x)$ and state its domain. [3]