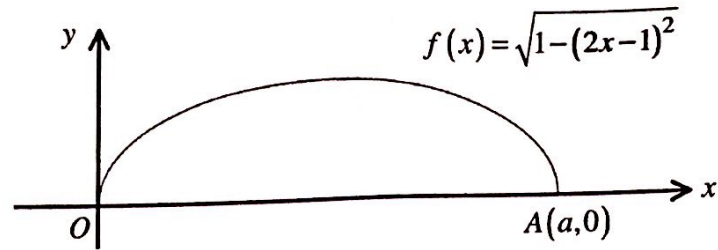


①



The figure above shows the graph of the function

$$f(x) \equiv \sqrt{1 - (2x-1)^2}, \quad x \in \mathbb{R}, \quad 0 \leq x \leq a.$$

- Find the value of the constant a .
- State the range of $f(x)$.

The function g is suitably defined by

$$g(x) = 2f\left(\frac{1}{2}x\right) - 2.$$

- Sketch the graph of $g(x)$.
- State the domain and range of $g(x)$.

②

The functions f and g are defined by

$$f(x) = x^2 - 4, \quad x \in \mathbb{R}, \quad x > 0$$

$$g(x) = 2x - 2, \quad x \in \mathbb{R}, \quad x > 3.$$

- State the range of $f(x)$ and the range of $g(x)$.
- Find a simplified expression for $fg(x)$.
- Determine the domain and range of $fg(x)$.

3

The functions f and g are defined by

$$f(x) = 3 \ln 2x, x \in \mathbb{R}, x > 0$$

$$g(x) = 2x^2 + 1, x \in \mathbb{R}.$$

Show that the value of the gradient on the curve $y = gf(x)$ at the point where $x = e$ is

$$\frac{P}{e}(1 + \ln 2).$$

State P

4

$$f(x) = 3x^2 - 18x + 21, x \in \mathbb{R}, x > 4.$$

- a) Express $f(x)$ in the form $A(x+B)^2 + C$, where A, B and C are integers.
- b) Find the range of $f(x)$.
- c) Find a simplified expression for $f^{-1}(x)$, the inverse of $f(x)$.
- d) Determine the domain and range of $f^{-1}(x)$.

The wrong answers spell a girls name

5

The functions f and g are defined by

$$f(x) = \sqrt{x+4}, x \in \mathbb{R}, x \geq -3$$

$$g(x) = 2x^2 - 3, x \in \mathbb{R}, x \leq 3.$$

- a) Find a simplified expression for $gf(x)$.
- b) Determine the domain and range of $gf(x)$.
- c) Solve the equation

$$fg(x) = 17.$$

J	$f(x) > -4$	A	$2x+5$
A	-6	I	$3 + \sqrt{\frac{x+6}{3}}$
A	$g(x) \geq 4$	A	$g(x) > 4$
E	$x > 3$	Y	$f^{-1}(x) > 4$
P	36	S	3
Y	$-1 < gf(x) \leq 15$	U	-12
J	$a=1$	S	$-3 \leq x \leq 5$
M	$f(x) > -3$	A	$x > -3$
L	-3		
Y	$0 \leq x \leq 2$		
T	$-1 \leq gf(x) \leq 15$		

$$K \quad 0 \leq f(x) \leq 1$$

$$U \quad fg(x) > 12$$

$$M \quad fg(x) \geq 12$$

$$I \quad 4 > x^2 - 8 > x$$

$$R \quad f(x) < -3$$

$$M \quad -2 \leq g(x) \leq 0$$