

ANSWERS - Modified Version.

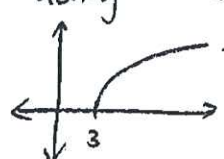
1. The function f is given by $f(x) = \sqrt{\ln(x-2)}$. Find the domain of the function.

Working:

domain: $\{x \mid x \geq 3\}$

range: $\{y \mid y > 0\}$

using the GDC:



\therefore Domain: $\{x \mid x \in \mathbb{R}, x \geq 3\}$

Answer:

.....

(Total 4 marks)

2. Let $g(x) = 3x - 2$, $h(x) = \frac{5x}{x-4}$, $x \neq 4$.

(a) Find an expression for $(h \circ g)(x)$. Simplify your answer.

(b) Solve the equation $(h \circ g)(x) = 0$.

a)
$$(h \circ g)(x) = \frac{5(3x-2)}{(3x-2)-4} = \frac{15x-10}{3x-6}$$

b)
$$(h \circ g)(x) = \frac{15x-10}{3x-6} = 0$$

$$\therefore 15x - 10 = 0$$

$$15x = 10$$

$$x = \frac{15}{10} = \frac{3}{2}$$

$$= \frac{10}{15} = \frac{2}{3}$$

(Total 6 marks)

3. Let $f(x) = x^3 - 4$ and $g(x) = 2x$.

(a) Find $(g \circ f)(-2)$.

$$(g \circ f)(x) = 2(x^3 - 4) = 2x^3 - 8$$
$$(g \circ f)(-2) = 2(-2)^3 - 8 = 2(-8) - 8 = -16 - 8 = -24$$

or

$$f(-2) = (-2)^3 - 4 = -8 - 4 = -12$$
$$g(-12) = 2(-12) = -24$$

4. Let $f(x) = 2x + 1$ and $g(x) = 3x^2 - 4$.

Find

(b) $(g \circ f)(-2)$;

(c) $(f \circ g)(x)$.

Working:

b) $(g \circ f)(x) = 3(2x+1)^2 - 4 = 3(4x^2 + 4x + 1) - 4 = 12x^2 + 12x - 1$

$(g \circ f)(-2) = 12(-2)^2 + 12(-2) - 1 = 48 - 24 - 1 = 23$

c) $(f \circ g)(x) = 2(3x^2 - 4) + 1$
 $= 6x^2 - 8 + 1$
 $= 6x^2 - 7$

Answers:

(b)

(c)

5. The functions f and g are defined by $f: x \mapsto 3x$, $g: x \mapsto x + 2$.

- (a) Find an expression for $(f \circ g)(x)$.

$(f \circ g)(x) = 3(x+2) = 3x + 6$

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6. Consider the functions $f(x) = 2x$ and $g(x) = \frac{1}{x-3}$, $x \neq 3$.

(a) Calculate $(f \circ g)(4)$.

$$(f \circ g)(x) = 2\left(\frac{1}{x-3}\right) = \frac{2}{x-3}$$
$$(f \circ g)(4) = \frac{2}{4-3} = \frac{2}{1} = 2$$

or

$$g(4) = \frac{1}{4-3} = \frac{1}{1} = 1$$

$$f(1) = 2(1) = 2$$

7. Let $f(x) = x^3 - 4$ and $g(x) = 2x$.

(a) Find $(g \circ f)(-2)$.

$$(f \circ g)(x) = (2x)^3 - 4 = 8x^3 - 4$$

$$(g \circ f)(x) = 2(x^3 - 4) = 2x^3 - 8$$

$$(g \circ f)(-2) = 2(-2)^3 - 8 = 2(-8) - 8 = -16 - 8 = -24$$

or

$$f(-2) = (-2)^3 - 4 = -8 - 4 = -12$$

$$g(-12) = 2(-12) = -24$$