Functions – Practice Problems

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

   Working:

   Answer: ...................................................

   (Total 4 marks)

2. Let \( f(x) = \sqrt{x+4}, x \geq -4 \) and \( g(x) = x^2, x \in \mathbb{R} \).

   (a) Find \((g \circ f)(3)\).
   (b) Find \(f^{-1}(x)\).
   (c) Write down the domain of \(f^{-1}\).

   Working:

   Answer: ...................................................

   (Total 6 marks)

3. Two functions \( f \) and \( g \) are defined as follows:

   \[
   f(x) = \cos x, \quad 0 \leq x \leq 2\pi; \\
   g(x) = 2x + 1, \quad x \in \mathbb{R}.
   \]

   Solve the equation \((g \circ f)(x) = 0\).

   Working:

   Answer: ...................................................

   (Total 4 marks)
4. Let \( f(x) = \sqrt{x} \), and \( g(x) = 2^x \). Solve the equation \((f^{-1} \circ g)(x) = 0.25\).

**Working:**

**Answer:**

…………………………………………………………………………………

(Total 4 marks)

5. Two functions \( f, g \) are defined as follows:
    \[ f : x \to 3x + 5 \]
    \[ g : x \to 2(1 - x) \]

Find
(a) \( f^{-1}(2) \);
(b) \( (g \circ f)(-4) \).

**Working:**

**Answers:**

(a) …………………………………………………
(b) …………………………………………………

(Total 4 marks)

6. Let \( f(x) = 2^x \), and \( g(x) = \frac{x}{x-2}, (x \neq 2) \).

Find
(a) \( (g \circ f)(3) \);
(b) \( g^{-1}(5) \).

**Working:**

**Answers:**

(a) …………………………………………………
(b) …………………………………………………

(Total 6 marks)
7. Consider the functions $f : x \mapsto 4(x - 1)$ and $g : x \mapsto \frac{6 - x}{2}$.

(a) Find $g^{-1}$.
(b) Solve the equation $(f \circ g^{-1})(x) = 4$.

\textit{Working:}

\textit{Answers:}
(a) ...........................................................................
(b) ...........................................................................

(Total 6 marks)

8. Let $f(x) = e^{-x}$, and $g(x) = \frac{x}{1 + x}$, $x \neq -1$. Find

(a) $f^{-1}(x)$;
(b) $(g \circ f)(x)$.

\textit{Working:}

\textit{Answers:}
(a) ...........................................................................
(b) ...........................................................................

(Total 6 marks)

9. The diagram shows three graphs.

A is part of the graph of $y = x$.
B is part of the graph of $y = 2^x$.
C is the reflection of graph B in line A.

Write down
(a) the equation of C in the form $y = f(x)$;
(b) the coordinates of the point where C cuts the x-axis.

\textit{Working:}

\textit{Answers:}
(a) ...........................................................................
(b) ...........................................................................
10. The function \( f \) is defined by
\[
f : x \rightarrow \sqrt{3 - 2x}, \quad x \leq \frac{3}{2}.
\]
Evaluate \( f^{-1}(5) \).

**Working:**

**Answer:**

11. Given that \( f(x) = 2e^{3x} \), find the inverse function \( f^{-1}(x) \).

**Working:**

**Answer:**