Surname	
Other Names	
Candidate's Signature	

GCSE 9 - 1 Questions

Composite and Inverse Functions 2

Calculator Not Allowed

INSTRUCTIONS TO CANDIDATES

- Write your name in the space provided.
- Write your answers in the spaces provided in this question paper.
- Answer ALL questions.
- Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
- You should have a ruler, compass and protractor where required.

Total Marks :

1) Let

$$f(x) = 2x + 3$$

$$g(x) = 2x - 3$$

a) Find $fg(x)$

Answer.....[2]

b) Find $gf(x)$

Answer.....[2]

c) Find $fg(1)$

Answer.....[2]

2) Given that $f(x) = x^2 + 24$ and $g(x) = 10x - 1$

a) Work out $g(5)$

Answer.....[1]

b) Work out $f(5)$

Answer.....[2]

c) Write down the inverse function : $g^{-1}(x)$

Answer.....[2]

d) Evaluate $g(\frac{1}{5}) + g^{-1}(9)$

Answer.....[3]

3) Let

$$f(x) = 3x^2 + 2x$$

$$g(x) = 3x + 2$$

a) Find $f(1.5)$

Answer.....[1]

b) Find $g^{-1}(x)$

Answer.....[2]

c) Find $fg(1)$

Answer.....[3]

4) Given that $\mathrm{h}(\mathrm{x}) = 6 - 2\mathrm{x}$

a) Work out $h^{-1}(\mathrm{x})$

Answer.....[2]

b) Work out $h(h^{-1}(4))$

Answer.....[2]

c) Work out $h^{-1}(h(4))$

Answer.....[2]

d) Work out $h^{-1}(4) \times h(4)$

Answer.....[2]

5) Find the inverse of the following functions

a) $f(x) = x^3 + 7$

Answer.....[2]

b) $f(x) = \frac{x}{5} - 4$

Answer.....[2]

c) $f(x) = \sqrt[3]{x} + 8$

Answer.....[2]

d) $f(x) = \frac{2x+3}{x-1}$

Answer.....[4]

6) The function f is defined by $f(x) = x^3 - 2x^2 - 5x + 6$.
The function g is defined by $g(x) = x - 1$.
$f(g(x)) = x^3 - 5x^2 + 2x + 8$.

What is $f(g)x)) - g(f(x))$?

Answer.....[4]

7) Given that

$$f(x) = \frac{1}{x^2 - 4}$$

$$g(x) = 2x + 1$$

Find an expression for $g(f(x))$.

Answer.....[2]

8) The function f is defined as $f(x) = \frac{k}{x-3}$.

(a) Given that $f(5) = 6$, work out the value of k.

Answer.....[2]

(b) Work out the value of x given that $f(x) = 1.5$.

Answer.....[2]

(c) (i) Find $f^{-1}(x)$

Answer.....[2]

9) On a suitable set of real numbers, functions f and g are defined by

$f(x) = \frac{1}{x+2}$ and $g(x) = \frac{1}{x} - 2$.

Find $f(g(x))$ in its simplest form.

Answer.....[4]

10) $f(x) = 3 - x$ and $g(x) = \frac{3}{x}$, $x \neq 0$.

Find $p(x)$ where $p(x) = f(g(x))$.

Answer.....[2]

11) Given that $f(x) = 2x - 1,\ g(x) = 3 - 2x$ and $h(x) = \frac{1}{4}(5 - x)$.

(a) Let $k(x) = f(g(x))$ What is the function $k(x)$

Answer.....[2]

(b) Simplify $h(k(x))$

Answer.....[3]

12) Functions f, g and h are defined on the set of real numbers by

- $f(x) = x^3 - 1$
- $g(x) = 3x + 1$
- $h(x) = 4x - 5$.

(a) Find $g(f(x))$.

Answer.....[3]

(b) Show that $g(f(x)) + xh(x) = 3x^3 + 4x^2 - 5x - 2$.

[4]

13)(*a*) $f(x) = 4x^2 - 3x + 5$.

(i) Show that $f(x + 1)$ simplifies to $4x^2 + 5x + 6$ and find a similar expression for $f(x - 1)$.

[3]

(a)(ii)

Hence show that $\frac{f(x+1)-f(x-1)}{2}$ simplifies to $8x-3$.

Answer.....[2]

(b) $g(x) = 2x^2 + 7x - 8$.

Find a similar expression for $\frac{g(x+1) - g(x-1)}{2}$.

Answer.....[4]

(c) By examining your answers for (*a*) and (*b*), **write down** the simplified expression for $\frac{h(x+1)-h(x-1)}{2}$, where $h(x)=3x^2+5x-1$.

Answer.....[2]