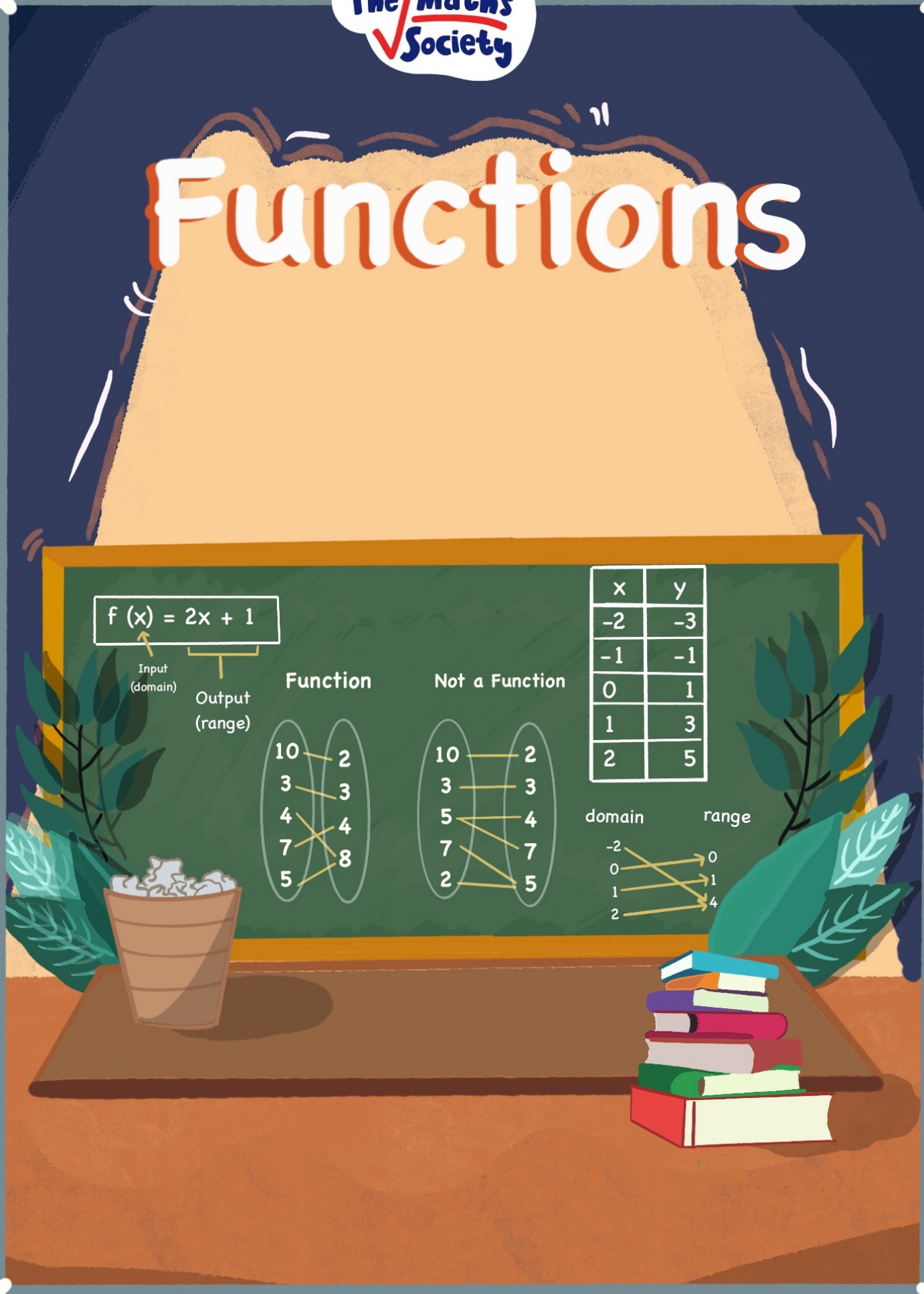
The Maths Society

Functions



Question 1

$f(x) = 3 + 4x$ $g(x) = 6x + 7$

Find, in its simplest form,

(a) $f(3x)$, [1]

$f(3x) = 3(3+4x)$
$= 9 + 12x$

(b) $fg(x)$. [2]

$fg(x) = f(6x+7)$
$= 3 + 4(6x+7)$
$= 3 + 24x + 28$
$= 31 + 24x$

Question 2

$f(x) = x^3$ $g(x) = 3x - 5$ $h(x) = 2x + 1$

Work out

(a) $ff(2)$, [2]

$ff(2) = f(2^3)$
$= f(8)$
$= (8^3) = 512$

(b) $gh(x)$ and simplify your answer, [2]

$gh(x) = g(2x+1)$
$= 3(2x+1) - 5$
$= 6x + 3 - 5$
$= 6x - 2$

(c) $h^{-1}(x)$, the inverse of $h(x)$. [2]

let $y = h(x)$ then $h^{-1}(y) = x$

$y = 2x + 1$
$y - 1 = 2x$
$x = \frac{y-1}{2}$
$h^{-1}(y) = \frac{y-1}{2}$
$h^{-1}(x) = \frac{x-1}{2}$

Question 3

$f(x) = 5x - 3$ $\quad$ $g(x) = x^2$

(a) Find $fg(-2)$.

$fg(-2) = f(-2)^2$

$= f(4)$

$= 5(4) - 3$

$= 20 - 3$

$= 17$

[2]

(b) Find $gf(x)$, in terms of x, in its simplest form.

$gf(x) = g(5x - 3)$

$= (5x - 3)^2$

$= 25x^2 - 30x + 9$

[2]

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

let $y = f(x)$ then $f^{-1}(y) = x$

$y = 5x - 3$

$\frac{y+3}{5} = x$

$f^{-1}(y) = \frac{y+3}{5}$

$f^{-1}(x) = \frac{x+3}{5}$

Question 4

$f(x) = 3x - 2$ $\quad$ $g(x) = \frac{2}{x+1}$, $\quad x \neq -1$

(a) Find $gf(2)$.

[2]

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

$= g(4)$

$= \frac{2}{4+1} = \frac{2}{5}$

(b) Solve $g(x) = 10$.

[2]

$g(x) = 10$

$\frac{2}{x+1} = 10$

$2 = 10x + 10$

$10x = 12$

$x = \frac{12}{10} = \frac{6}{5}$

(c) Simplify.

$f(2x) - f(x+2)$

[3]

$2(3x - 2) - (3x - 2 + 2)$

$6x - 4 - 3x + 2 - 2$

$3x - 4$

Question 5

$f(x) = (x-3)^2$ $\quad g(x) = \frac{x-1}{4}$ $\quad h(x) = x^3$

Find

(a) hf(1), [2]

$hf(1) = h(1-3)^2$
$= h(4)$
$= (4)^3 = 64$

(b) $g^{-1}(x)$, [2]

Let $y = g(x)$ then $g^{-1}(y) = x$

$y = \frac{x-1}{4} \rightarrow 4y+1 = x \rightarrow g^{-1}(y) = 4y+1$
$g^{-1}(x) = 4x+1$

(c) gh(x), [1]

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

(d) the solution to the equation $f(x) = 0$. [1]

$(x-3)^2 = 0$
$x^2 - 6x + 9 = 0$
$(x-3)(x-3) = 0$
$x = 3$

Question 1

$f(x) = 2x + 3$ $\quad g(x) = x^2$

(a) Find fg(6). [2]

$fg(6) = f(6)^2$
$= f(36)$
$= 2(36) + 3$
$= 72 + 3 = 75$

(b) Solve the equation $gf(x) = 100$. [3]

$gf(x) = 100$
$g(2x+3)^2 = 100$
$(2x+3)^2 = 100$

$4x^2 + 12x + 9 = 100$
$4x^2 + 12x - 91 = 0$
$(2x-7)(2x+13) = 0$
$x = \frac{7}{2}$ (or) $x = -\frac{13}{2}$

(c) Find $f^{-1}(x)$. [2]

let $y = f(x)$ then $f^{-1}(y) = x$
$y = 2x + 3$
$y - 3 = 2x$
$x = \frac{y-3}{2}$
$f^{-1}(y) = \frac{y-3}{2}$
$f^{-1}(x) = \frac{x-3}{2}$

(d) Find $ff^{-1}(5)$. [1]

$ff^{-1}(5) = f\left(\frac{5-3}{2}\right) = f(1)$
$= 2(1) + 3 = 5$

Question 2

$f(x) = 5x + 4$ $\quad$ $g(x) = \frac{1}{2x}, \ x \neq 0$ $\quad$ $h(x) = \left(\frac{1}{2}\right)^x$

Find

(a) fg(5), [2]

$fg(5) = f\left(\frac{1}{2(5)}\right) = f\left(\frac{1}{10}\right) = 5\left(\frac{1}{10}\right) + 4$

$= \frac{1}{2} + 4 = 4.5$

(b) gg(x) in its simplest form, [2]

$gg(x) = g\left(\frac{1}{2x}\right) = \frac{1}{2\left(\frac{1}{2x}\right)} = x$

(c) $f^{-1}(x)$, [2]

Let $y = f(x)$ then $f^{-1}(y) = x$

$y = 5x + 4$ $\quad$ $f^{-1}(y) = \frac{y-4}{5}$ $\quad$ $f^{-1}(x) = \frac{x-4}{5}$

$\frac{y-4}{5} = x$

(d) the value of x when $h(x) = 8$. [2]

$h(x) = 8$

$\left(\frac{1}{2}\right)^x = 8$

$x = -3$

Question 3

$f(x) = x + \frac{2}{x} - 3, x \neq 0$ $\quad$ $g(x) = \frac{x}{2} - 5$

Find

(a) fg(18), [2]

$fg(18) = f\left(\frac{18}{2} - 5\right)$

$= f(4)$

$= 4 + \frac{2}{4} - 3 = \frac{3}{2}$

(b) $g^{-1}(x)$. [2]

Let $y = g(x)$ then $g^{-1}(y) = x$

$y = \frac{x}{2} - 5$

$y + 5 = \frac{x}{2}$

$2(y + 5) = x$

$x = 2y + 10$

$g^{-1}(y) = 2y + 10$

$g^{-1}(x) = 2x + 10$

Question 4

$$f(x) = 4(x + 1) \qquad g(x) = \frac{x^3}{2} - 1$$

(a) Write down the value of x when $f^{-1}(x) = 2$.

let $y = f(x)$ then $f^{-1}(y) = x$

$y = 4(x+1)$ $\quad \frac{y-4}{4} = x$

$y = 4x + 4$

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

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

$\frac{x-4}{4} = 2$

$x - 4 = 8$

$x = 12$

[1]

(b) Find $fg(x)$. Give your answer in its simplest form.

$fg(x) = f\left(\frac{x^3}{2} - 1\right)$

$= 4\left(\frac{x^3}{2} \cancel{-1} \cancel{+1}\right)$

$= \frac{4x^3}{2} = 2x^3$

[2]

(c) Find $g^{-1}(x)$.

let $y = g(x)$ then $g^{-1}(y) = x$

$y = \frac{x^3}{2} - 1$

$y + 1 = \frac{x^3}{2}$

$2y + 2 = x^3$

$x = \sqrt[3]{2y+2}$

$g^{-1}(y) = \sqrt[3]{2y+2}$

$g^{-1}(x) = \sqrt[3]{2x+2}$

[3]

Question 1

$$f(x) = x^2 + 1 \qquad g(x) = \frac{x+2}{3}$$

(a) Work out $ff(-1)$.

$ff(-1) = f(-1^2 + 1)$

$= f(2)$

$= 2^2 + 1$

$= 5$

[2]

(b) Find $gf(3x)$, simplifying your answer as far as possible.

$gf(3x) = g(3x^2 + 1)$

$= \frac{3x^2 + 1 + 2}{3}$

$= \frac{3x^2 + 3}{3} = x^2 + 1$

[3]

(c) Find $g^{-1}(x)$.

Let $y = g(x)$ then $g^{-1}(y) = x$

$y = \frac{x+2}{3}$ $\qquad g^{-1}(x) = 3x - 2$

$3y - 2 = x$

$g^{-1}(y) = 3y - 2$

[2]

Question 2

$f(x) = 3x + 5$ $\quad$ $g(x) = 4x - 1$

(a) Find the value of gg(3).

$gg(3) = g(12-1)$
$= g(11)$
$= 3(11)+5$
$= 33+5$
$= 38$

[2]

(b) Find fg(x), giving your answer in its simplest form.

$fg(x) = f(4x-1)$
$= 3(4x-1)+5$
$= 12x - 3 + 5$
$= 12x + 2$
$= 2(6x+1)$

[2]

(c) Solve the equation. $f^{-1}(x) = 11$

Let $y = f(x)$ then $f^{-1}(y) = x$
$y = 3x + 5$ $\quad$ $f^{-1}(y) = \frac{y-5}{3}$ $\quad$ $\frac{x-5}{3} = 11$
$\frac{y-5}{3} = x$ $\quad$ $f^{-1}(x) = \frac{x-5}{3}$ $\quad$ $x - 5 = 33$
$x = 38$

[1]

Question 3

$f(x) = \frac{1}{x+4}$ $\quad (x \neq -4)$

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

$h(x) = x^3 + 1$

(a) Work out fg(1).

$fg(1) = f(1^2 - 3(1))$
$= f(1-3)$
$= f(-2)$
$= \frac{1}{-2+4} = \frac{1}{2}$

[2]

(b) Find $h^{-1}(x)$.

Let $y = h(x)$ then $h^{-1}(y) = x$
$y = x^3 + 1$ $\quad$ $h^{-1}(y) = \sqrt[3]{y-1}$
$y - 1 = x^3$ $\quad$ $h^{-1}(x) = \sqrt[3]{x-1}$
$x = \sqrt[3]{y-1}$

[2]

(c) Solve the equation $g(x) = -2$.

$g(x) = -2$
$x^2 - 3x = -2$
$x^2 - 3x + 2 = 0$
$(x-2)(x-1) = 0$
$x = 2$ (or) $x = 1$

[3]

Question 4

$f(x) = x^3$ $\quad$ $g(x) = 2x - 3$

(a) Find

(i) g(6), [1]

$= 2(6) - 3$
$= 12 - 3$
$= 9$

(ii) f(2x). [1]

$f(2x) = (2x)^3$
$= 8x^3$

(b) Solve $fg(x) = 125$. [3]

$fg(x) = 125$
$f(2x-3) = 125$
$(2x-3)^3 = 125$
$2x - 3 = \sqrt[3]{125}$

$2x - 3 = 5$
$2x = 8$
$x = 4$

(c) Find the inverse function $g^{-1}(x)$. [2]

let $y = g(x)$ then $g^{-1}(y) = x$
$y = 2x - 3$
$\frac{y+3}{2} = x$
$g^{-1}(y) = \frac{y+3}{2}$
$g^{-1}(x) = \frac{x+3}{2}$

Question 5

$f(x) = x^2$ $\quad$ $g(x) = 2^x$ $\quad$ $h(x) = 2x - 3$

(a) Find g(3). [1]

$g(3) = 2^3$
$= 8$

(b) Find hh(x) in its simplest form. [2]

$hh(x) = h(2x-3)$
$= 2(2x-3) - 3$
$= 4x - 6 - 3$
$= 4x - 9$

(c) Find fg(x + 1) in its simplest form. [2]

$fg(x+1) = f(2^{x+1})$
$= (2^{x+1})^2$
$= 2^{2x+2}$

Question 1

$f(x) = \frac{x}{4} - 3$ $\quad$ $g(x) = 6x - 7$ $\quad$ $h(x) = 2^x$

(a) Work out the value of x when $f(x) = -0.5$. [2]

$\frac{x}{4} - 3 = -0.5$

$\frac{x}{4} = 2.5$

$x = 10$

(b) Find $g^{-1}(x)$. [2]

Let $y = g(x)$ then $g^{-1}(y) = x$

$y = 6x - 7$ $\quad$ $g^{-1}(y) = \frac{y+7}{6}$

$\frac{y+7}{6} = x$ $\quad$ $g^{-1}(x) = \frac{x+7}{6}$

(c) Work out the value of x when $h(x) = f(13)$. [2]

$h(x) = f(13)$

$2^x = \frac{13}{4} - 3$

$2^x = \frac{1}{4}$

$2^x = 2^{-2}$

$x = -2$

Question 2

$f(x) = x^2$ $\quad$ $g(x) = \frac{x-3}{2}$

Find

(a) $f(-5)$, [1]

$(-5)^2 = 25$

(b) $gf(x)$, [1]

$gf(x) = g(x^2)$

$= \frac{x^2 - 3}{2}$

(c) $g^{-1}(x)$. [2]

Let $y = g(x)$ then $g^{-1}(y) = x$

$y = \frac{x-3}{2}$

$2y + 3 = x$

$g^{-1}(y) = 2y + 3$

$g^{-1}(x) = 2x + 3$

Question 3

$f(x) = 5-3x$

(a) Find f(6). [1]

$= 5-3(6)$

$= 5-18$

$= -13$

(b) Find f($x+2$). [1]

$5-3(x+2)$

$5-3x-6$

$-1-3x$

(c) Find ff(x), in its simplest form. [2]

$ff(x) = f(5-3x)$

$= 5-3(5-3x)$

$= 5-15+9x$

$= -10+9x$

(d) Find $f^{-1}(x)$, the inverse of f(x). [2]

Let $y = f(x)$ then $f^{-1}(y) = x$

$y = 5-3x$ $\quad f^{-1}(y) = \frac{5-y}{3}$

$3x = 5-y$ $\quad f^{-1}(x) = \frac{5-x}{3}$

$x = \frac{5-y}{3}$

Question 4

$f(x) = 3x+5$ $\qquad g(x) = x^2$

(a) Find g($3x$). [1]

$(3x)^2 = 9x^2$

(b) Find $f^{-1}(x)$, the inverse function. [2]

Let $y = f(x)$ then $f^{-1}(y) = x$

$y = 3x+5$ $\quad f^{-1}(y) = \frac{y-5}{3}$

$\frac{y-5}{3} = x$ $\quad f^{-1}(x) = \frac{x-5}{3}$

(c) Find ff(x).
Give your answer in its simplest form. [2]

$ff(x) = f(3x+5)$

$= 3(3x+5)+5$

$= 9x+15+5$

$= 9x+20$

Question 1

$f(x) = (x + 2)^3 - 5$ $g(x) = 2x + 10$ $h(x) = \frac{1}{x}, x \neq 0$

Find

(a) gf (x), [2]

$gf(x) = g(x+2)^3 - 5$

$= 2((x+2)^3 - 5) + 10$

$= 2(x^3+6x^2+12x+8-5)+10$

$= 2x^3+12x^2+24x+6+10$

$= 2x^3+12x^2+24x+16$

$(x+2)^2(x+2)$

$=(x^2+4x+4)(x+2)$

$= x^3+2x^2+4x^2+8x+4x+8$

$= x^3+6x^2+12x+8$

(b) $f^{-1}(x)$, [3]

let $y = f(x)$ then $f^{-1}(y) = x$

$y = (x+2)^3 - 5$

$y+5 = (x+2)^3$

$\sqrt[3]{y+5} = x+2$

$\sqrt[3]{y+5} - 2 = x$

$f^{-1}(y) = \sqrt[3]{y+5} - 2$

$f^{-1}(x) = \sqrt[3]{x+5} - 2$

(c) gh $(-\frac{1}{5})$. [2]

$gh(-\frac{1}{5}) = g(\frac{1}{-\frac{1}{5}})$

$= g(-5)$

$= 2(-5)+10$

$= -10 + 10 = 0$

Question 2

$f(x) = (x-1)^3$ $g(x) = (x-1)^2$ $h(x) = 3x + 1$

(a) Work out fg(-1). [2]

$fg(-1) = f(-1-1)^2$

$= f(4)$

$= (4-1)^3$

$= 27$

(b) Find gh(x) in its simplest form. [2]

$gh(x) = g(3x+1)$

$= (3x+1-1)^2$

$= 9x^2$

(c) Find $f^{-1}(x)$. [2]

Let $y = f(x)$ then $f^{-1}(y) = x$

$y = (x-1)^3$

$\sqrt[3]{y} = x-1$

$x = \sqrt[3]{y} + 1$

$f^{-1}(y) = \sqrt[3]{y} + 1$

$f^{-1}(x) = \sqrt[3]{x} + 1$

Question 3

(a) $f(x) = 1 - 2x$.

(i) Find f(-5). [1]

$f(-5) = 1 - 2(-5)$
$= 1 + 10$
$= 11$

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

Find $gf(x)$. Simplify your answer. [2]

$gf(x) = g(1 - 2x)$
$= 3(1 - 2x) - 2$
$= 3 - 6x - 2$
$= 1 - 6x$

(b) $h(x) = x^2 - 5x - 11$.

Solve $h(x) = 0$. [4]

Show all your working and give your answer correct to 2 decimal places.

$x^2 - 5x - 11 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{5 \pm \sqrt{25 - 4(1)(-11)}}{2(1)}$

$= \frac{5 \pm \sqrt{25 + 44}}{2}$

$x = \frac{5 \pm \sqrt{69}}{2}$

$x = \frac{5 + \sqrt{69}}{2}$ (or) $x = \frac{5 - \sqrt{69}}{2}$

$x = 6.65$ (or) $x = -1.65$

Question 4

$f: x \to 1 - 2x$ and $g: x \to \frac{x}{2}$.

(a) Find fg(7). [2]

$fg(7) = f(\frac{7}{2})$
$= 1 - 2(\frac{7}{2})$
$= -6$

(b) (i) Solve $f(x) = g(x)$. [2]

$1 - 2x = \frac{x}{2}$

$2 - 4x = x$

$2 = 5x$

$x = \frac{2}{5}$

(ii) The graphs of $y = f(x)$ and $y = g(x)$ meet at M.
Find the coordinates of M. [1]

$y = 1 - 2x$

$y = 1 - 2(\frac{2}{5})$

$= \frac{1}{5}$

$(\frac{2}{5}, \frac{1}{5})$

Question 1

$f : x \to 2x - 7$ $\quad$ $g : x \to \frac{1}{x}$

Find

(a) $fg\left(\frac{1}{2}\right)$, $f\left(\frac{1}{\frac{1}{2}}\right) = f(2)$
$= 2(2) - 7$
$= 4 - 7$
$= -3$

[2]

(b) $gf(x)$,

$gf(x) = g(2x-7)$
$= \frac{1}{2x-7}$

[1]

(c) $f^{-1}(x)$.

Let $y = f(x)$ then $f^{-1}(y) = x$

$y = 2x - 7$ $\quad$ $f^{-1}(x) = \frac{x+7}{2}$

$\frac{y+7}{2} = x$

$f^{-1}(y) = \frac{y+7}{2}$

[2]

Question 2

$f(x) = x^2 + 2$ $\quad$ $g(x) = (x+2)^2$ $\quad$ $h(x) = 3x - 5$

Find

(a) $gf(-2)$,

$g(-2^2+2) = g(6)$
$= (6+2)^2 = 64$

[2]

(b) $h^{-1}(22)$.

Let $y = h(x)$ then $h^{-1}(y) = x$

$y = 3x - 5$

$\frac{y+5}{3} = x$

$h^{-1}(y) = \frac{y+5}{3}$

$h^{-1}(x) = \frac{x+5}{3}$

[2]

Question 3

$f(x) = 4x + 1$ $g(x) = x^3 + 1$ $h(x) = \frac{2x+1}{3}$

(a) Find the value of gf(0).

$g(0+1) = g(1)$
$= 1^3 + 1$
$= 2$

[2]

(b) Find fg(x). Simplify your answer.

$fg(x) = f(x^3+1)$
$= 4(x^3+1) + 1$
$= 4x^3 + 4 + 1$
$= 4x^3 + 5$

[2]

(c) Find $h^{-1}(x)$.

Let $y = h(x)$ then $h^{-1}(y) = x$

$y = \frac{2x+1}{3}$ $h^{-1}(y) = \frac{3y-1}{2}$

$\frac{3y-1}{2} = x$ $h^{-1}(x) = \frac{3x-1}{2}$

[2]

Question 4

$f(x) = \cos x°$, $g(x) = 2x + 4$.

Find

(a) f(60), $= \cos 60°$
$= \frac{1}{2}$

[1]

(b) fg(88),

$fg(88) = f(2(88)+4)$
$= f(180)$
$= \cos 180°$
$= -1$

[2]

(c) $g^{-1}(f(x))$.

Let $y = g(x)$ then $g^{-1}(y) = x$

$y = 2x + 4$ $g^{-1}(y) = \frac{y-4}{2}$

$\frac{y-4}{2} = x$ $g^{-1}(x) = \frac{x-4}{2}$ $g^{-1}(fx) = \frac{\cos x - 4}{2}$

[2]

Question 1

The function f(x) is given by

$$f(x) = 3x - 1.$$

Find, in its simplest form,

(a) $f^{-1}f(x)$, [1]

Let $y = f(x)$ then $f^{-1}(y) = x$

$y = 3x - 1$ $\quad f^{-1}(y) = \frac{y+1}{3}$

$\frac{y+1}{3}$ $\quad f^{-1}(x) = \frac{x+1}{3}$

(b) $ff(x)$. [2]

$ff(x) = f(3x-1)$

$= 3(3x-1) - 1$

$= 9x - 3 - 1$

$= 9x - 4$

Question 2

f: $x \mapsto 5 - 3x$.

(a) Find f(−1). [1]

$5 - 3(-1) = 5 + 3$

$= 8$

(b) Find $f^{-1}(x)$. [2]

Let $y = f(x)$ then $f^{-1}(y) = x$

$y = 5 - 3x$ $\quad x = \frac{5-y}{3}$

$y - 5 = -3x$ $\quad f^{-1}(y) = \frac{5-y}{3}$

$-y + 5 = 3x$ $\quad f^{-1}(x) = \frac{5-x}{3}$

$\frac{-y+5}{3} = x$

(c) Find $ff^{-1}(8)$. [1]

$ff^{-1}(8) = f\left(\frac{5-8}{3}\right)$

$= f(-1)$

$= 5 - 3(-1)$

$= 5 + 3$

$= 8$

Question 3

$$f(x) = \frac{x + 3}{x}, x \neq 0.$$

(a) Calculate f $(\frac{1}{4})$. [1]

$$= \frac{\frac{1}{4} + 3}{\frac{1}{4}} = 13$$

(b) Solve $f(x) = \frac{1}{4}$. [2]

$$\frac{x+3}{x} = \frac{1}{4}$$
$$x + 3 = \frac{1}{4}x$$
$$x - \frac{1}{4}x = -3$$
$$\frac{3}{4}x = -3$$
$$x = -4$$

Question 4

$f(x) = 10^{x}$.

(a) Calculate f(0.5). [1]

$$10^{0.5} = 3.16$$

(b) Write down the value of $f^{-1}(1)$. [1]

Let $y = 10^{x}$ then $f^{-1}(y) = x$

$$y = 10^{x}$$
$$x = \log y$$
$$f^{-1}(y) = \log y$$
$$f^{-1}(x) = \log x$$

Question 5

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

(a) Find the value of $gf(9)$. [1]

$g\left(\frac{9+1}{2}\right) = g(5)$

$= 2(5)+1$

$= 11$

(b) Find $gf(x)$, giving your answer in its simplest form. [2]

$gf(x) = g\left(\frac{x+1}{2}\right)$

$= 2\left(\frac{x+1}{2}\right)+1$

$= x+1+1$

$= x+2$

(c) Solve the equation $g^{-1}(x) = 1$. [2]

Let $y = g(x)$ then $g^{-1}(y) = x$

$y = 2x+1$

$\frac{y-1}{2} = x$

$g^{-1}(y) = \frac{y-1}{2}$

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

$\frac{x-1}{2} = 1$

$x-1 = 2$

$x = 3$

Question 6

$f: x \to 2x - 1$ and $g: x \to x^2 - 1$.
Find, in their simplest forms,

(a) $f^{-1}(x)$, [2]

Let $y = f(x)$ then $f^{-1}(y) = x$

$y = 2x-1$ $\quad f^{-1}(y) = \frac{y+1}{2}$

$\frac{y+1}{2} = x$ $\quad f^{-1}(x) = \frac{x+1}{2}$

(b) $gf(x)$. [2]

$gf(x) = g(2x-1)$

$= (2x-1)^2 - 1$

$= 4x^2 - 4x + 1 - 1$

$= 4x^2 - 4x$

$= 4x(x-1)$