

1. $f(x) = 1 + 4x$, $g(x) = x^2$

(a) Find

(i) $gf(3)$, [2] (ii) $fg(x)$, [1] (iii) $f^{-1}f(x)$. [1]

(b) Find the value of x when $f(x) = 15$. [2]

0580/42/F/M/22 Q3)



[Q1 – Q18]

2. $f(x) = 7x - 4$, $g(x) = \frac{2x}{x-3}, x \neq 3$, $h(x) = x^2$

(a) Find $g(6)$. [1]

(b) Find $fg(4)$. [2]

(c) Find $fh(x)$. [1]

(d) Find $\frac{f(x)}{2} + g(x)$.

Give your answer as a single fraction, in terms of x , in its simplest form. [3]

(e) Find the value of x when $f(x + 2) = -11$. [2]

(f) Find the values of p that satisfy $h(p) = p$. [2]

0580/43/M/J/20 Q11)



3. $f(x) = 7x - 2$ $g(x) = x^2 + 1$ $h(x) = 3^x$
(a) Find $gh(2)$. [2] (b) Find $f^{-1}(x)$ [2]
(c) $gg(x) = ax^4 + bx^2 + c$ Find the values of a , b and c . [4]
(d) Find x when $hf(x) = 81$. [3]

0580/41/M/J/19 Q9)

4. $f(x) = 8 - 3x$ $g(x) = \frac{10}{x+1}$, $x \neq -1$ $h(x) = 2^x$
(a) Find
(i) $hf\left(\frac{8}{3}\right)$ [2] (ii) $gh(-2)$, [2] (iii) $g^{-1}(x)$ [3] (iv) $f^{-1}f(5)$ [1]
(b) Write $f(x) + g(x)$ as a single fraction in its simplest form. [3]

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5. (a) $f(x) = 2x - 3$ $g(x) = x^2 + 1$
(i) Find $gg(2)$ [2] (ii) Find $g(x+2)$, giving your answer in its simplest form. [2]
(iii) Find x when $f(x) = 7$ [2] (iv) Find $f^{-1}(x)$ [2]
(b) $h(x) = x^v$
(i) Calculate $h(3)$ [2]
(ii) Find x when $h(x) = 256$. [1]
0580/43/M/J/18 Q10)

6. $f(x) = 3x - 2$ $g(x) = x^2$ $h(x) = 3^x$
(a) Find $f(-3)$ [1] (b) Find the value of x when $f(x) = 19$. [2]
(c) Find $fh(2)$. [2] (d) Find $gf(x) + f(x) + x$.
Give your answer in its simplest form [3]
(e) Find $f^{-1}(x)$ [2]
0580/42/M/J/17 Q10)



7. $f(x) = 3 - 2x$ $g(x) = \frac{4}{x}$, $x \neq 0$ $h(x) = 4^x$
- (a) Find $f(5)$. [1] (b) Find $gh(3)$. [2] (c) Find $f^{-1}(x)$. [2]
- (d) Show that $hf(x) = \frac{64}{16^x}$ [3] (e) Find the value of x when $h(x) = g(0.5)$. [2]
- 0580/41/O/N/17 Q7)**

8. $f(x) = 1 - 2x$ $g(x) = x + 4$ $h(x) = x^2 + 1$
- (a) Find $f(-1)$ [1] (b) Solve the equation $2f(x) = g(x)$ [2]
- (c) Find $fg(x)$. Give your answer in its simplest form. [2]
- (d) Find $hh(2)$. [2] (e) Find $f^{-1}(x)$ [2]
- (f) $hgf(x) = 4x^2 + px + q$
- Find the value of p and the value of q . [4]
- 0580/42/O/N/17 Q9)**



9. $f(x) = 2 - 3x$ $g(x) = 7x + 3$

(a) Find (i) $f(-3)$ [1] (ii) $g(2x)$ [1]

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

(c) Find x when $3f(x) = 7$ [3]

(d) Solve the equation. $f(x + 4) - g(x) = 0$ [3]

0580/42/F/M/16 Q11)

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

(a) Find $j(-1)$. [1]

(b) Find x when $f(x) + g(x) = 0$. [2]

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

(d) Find $hf(x) + gh(x)$, giving your answer as a single fraction in its simplest form. [4]

(e) When $pp(x) = x$, $p(x)$ is a function such that $p^{-1}(x) = p(x)$.

Draw a ring around the function that has this property. [1]

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

0580/42/F/M/23 Q11)



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

(a) Find $hf(1) - fh(1)$. [3]

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

(c) Solve the inequality $f(x) > g(x)$. [2]

(d) Solve the equation $h(x) = 1/9$ [1]

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

(f) Find $\frac{5}{f(x)} + g(x)$ [3]

(g) Solve the equation $f^{-1}(x) = 4$. [1]

0580/41/O/N/16 Q9)

12. $f(x) = 2x + 5$ $g(x) = 2^x$ $h(x) = 7 - 3x$

(a) Find (i) $f(3)$ [1] (ii) $gg(2)$ [2]

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

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

(d) Find the integer values of x which satisfy this inequality. $1 < f(x) \leq 9$ [3]

0580/42/O/N/15 Q9)



13. $f(x) = 2^{x-3}$ $g(x) = 2x - 1$ $h(x) = \frac{5}{x-4}$

(a) Find $ff(6)$. (b) Find $g^{-1}g(x + 21)$ (c) Find x when $f(x) = h(84)$.

0580/22/O/N/21 Q20)

14. $f(x) = 3x + 4$ $g(x) = 2x - 1$ $h(x) = 3^x$

(a) Find $g(\frac{1}{2})$ [1] (b) Find $fh(-1)$ [2] (c) Find $g^{-1}(x)$ [2]

(d) Find $ff(x)$ in its simplest form. [2] (e) Find $(f(x))^2$ in the form $ax^2 + bx + c$. [2]

(f) Find x when $h^{-1}(x) = g(2)$ [2]

0580/43/O/N/18 Q9)



15. $f(x) = 2x + 1$ $g(x) = x^2 + 4$ $h(x) = 2^x$

- (a) Solve the equation $f(x) = g(1)$. [2]
- (b) Find the value of $fh(3)$ [2]
- (c) Find $f^{-1}(x)$. [2]
- (d) Find $gf(x)$ in its simplest form. [3]
- (e) Solve the equation $h^{-1}(x) = 0.5$. [1]
- (f) $\frac{1}{h(x)} = 2^{kx}$. Write down the value of k . [1]

0580/41/M/J/16 Q8)

16. $f(x) = 2x - 1$ $g(x) = 1/x, x \neq 0$ $h(x) = 2^x$

- (a) Find $h(3)$ [1] (b) Find $fg(0.5)$. [2] (c) Find $f^{-1}(x)$. [2]
- (d) Find $ff(x)$, giving your answer in its simplest form. [2]
- (e) Find $(f(x))^2 + 6$, giving your answer in its simplest form. [2]
- (f) Simplify $hh^{-1}(x)$. [1]
- (g) Which of the following statements is true? [1]

$f^{-1}(x) = f(x)$

$g^{-1}(x) = g(x)$

$h^{-1}(x) = h(x)$

- (h) Use two of the functions $f(x)$, $g(x)$ and $h(x)$

to find the composite function which is equal to $2^{x+1} - 1$. [1]

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

(a) Find the value of (i) $f(3)$ (ii) $gf(3)$ [1]

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

(c) Find x when $h(x) = 2$ [1]

(d) Find $g(x)g(x) - gg(x)$, giving your answer in the form $ax^2 + bx + c$ [4]

(e) Find $hh(x)$, giving your answer in its simplest form. [1]

(f) Find $j(3)$ [1]

(g) Find x when $j^{-1}(x) = 2$ [1]

(h) $j(x) = hg(-12)$, find the value of x [2]

0580/42/O/N/20 Q10

18. $f(x) = 10 - x$ $g(x) = \frac{2}{x}$, $x \neq 0$ $h(x) = 2^x$ $j(x) = 5 - 2x$

(a) (i) Find $g\left(\frac{1}{2}\right)$. [1]

(ii) Find $hg\left(\frac{1}{2}\right)$. [1]

(b) Find x when $f(x) = 7$. [1]

(c) Find x when $g(x) = h(3)$. [2]

(d) Find $j^{-1}(x)$. [2]

(e) Write $f(x) + g(x) + 1$ as a single fraction in its simplest form. [3]

(f) $(f(x))^2 - ff(x) = ax^2 + bx + c$ [4]

(g) Find x when $h^{-1}(x) = 5$ [2]

0580/41/O/N/22 Q7

19. $f(x) = \frac{3}{x+2}$, $x \neq -2$ $g(x) = 8x - 5$ $h(x) = x^2 + 6$

(a) Workout $g(\frac{1}{4})$ [1] (b) Workout $ff(2)$ [2]

(c) Find $gg(x)$, giving your answer in its simplest form. [2] (d) Find $g^{-1}(x)$ [2]

(e) Write $g(x) - f(x)$ as a single fraction in its simplest form. [3]

(f) (i) Show that $hg(x) = 19$ simplifies to $16x^2 - 20x + 3 = 0$ [3]

(ii) Solve $16x^2 - 20x + 3 = 0$.

Show all your working and give your answers correct to 2 decimal places [4]

0580/42/F/M/19 Q8)



[Q19 – Q25]

20. $f(x) = 5x + 7$ $g(x) = \frac{4}{x-3}$, $x \neq 3$

(a) Find (i) $fg(1)$, [2] (ii) $gf(x)$, [2] (iii) $g^{-1}(x)$ [3] (iv) $f^{-1}f(2)$. [1]

(b) $f(x) = g(x)$

(i) Show that $5x^2 - 8x - 25 = 0$. [3]

(ii) Solve $5x^2 - 8x - 25 = 0$.

Show all your working and give your answers correct to 2 decimal places [4]

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

(i) Work out $f(4)$. (ii) Work out $fh(-1)$ (iii) Find $f^{-1}(x)$, the inverse of $f(x)$ [2]

(iv) Find $ff(x)$ in its simplest form.) [2]

(v) Show that the equation $f(x) = g(x)$ simplifies to $2x^2 - 3x - 6 = 0$. [3]

(vi) Solve the equation $2x^2 - 3x - 6 = 0$.

Give your answers correct to 2 decimal places. Show all your working. [4]

0580/41/M/J/14 Q10

22. $f(x) = 1/x$, $x \neq 0$ $g(x) = 1 - x$ $h(x) = x^2 + 1$

(a) Find $fg(1/2)$ (b) Find $g^{-1}(x)$, the inverse of $g(x)$.

(c) Find $hg(x)$, giving your answer in its simplest form. [3]

(d) Find the value of x when $g(x) = 7$. [1]

(e) Solve the equation $h(x) = 3x$.

Show your working and give your answers correct to 2 decimal places. [4]

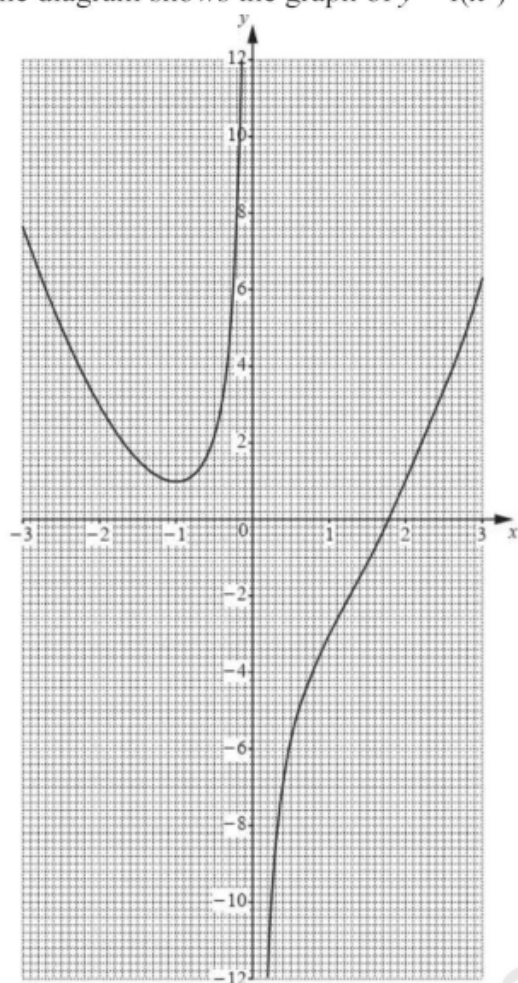
(f) A function $k(x)$ is its own inverse when $k^{-1}(x) = k(x)$.

For which of the functions $f(x)$, $g(x)$ and $h(x)$ is this true? [1]

0580/42/M/J/14 Q10)



23. The diagram shows the graph of $y = f(x)$



(a) Use the graph to find

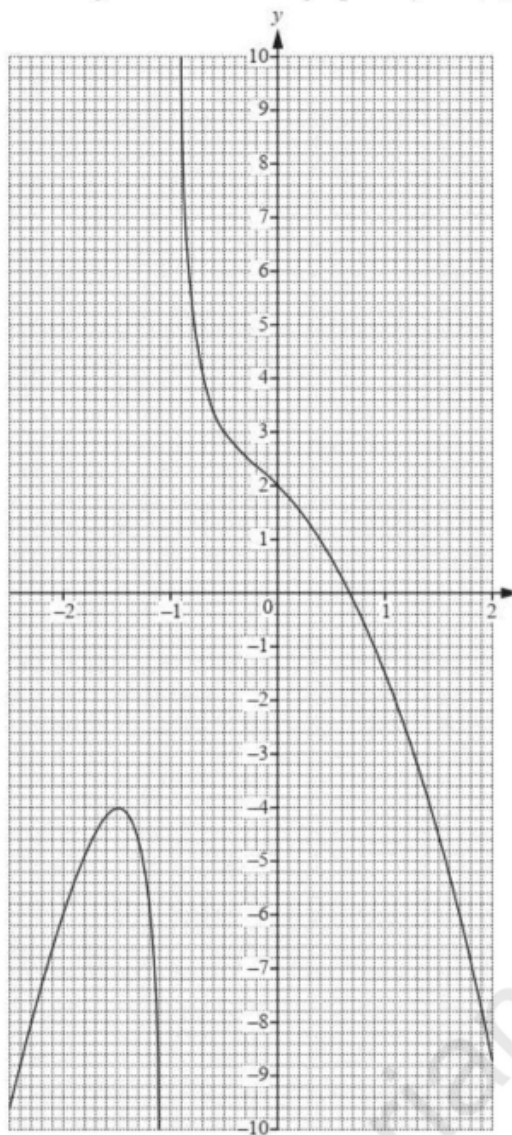
(i) $f(1)$, [1]

(ii) $ff(-2)$ [2]

0580/43/M/J/19 Q5)



24. The diagram shows the graph of $y = f(x)$ for $-2.5 \leq x \leq 2$

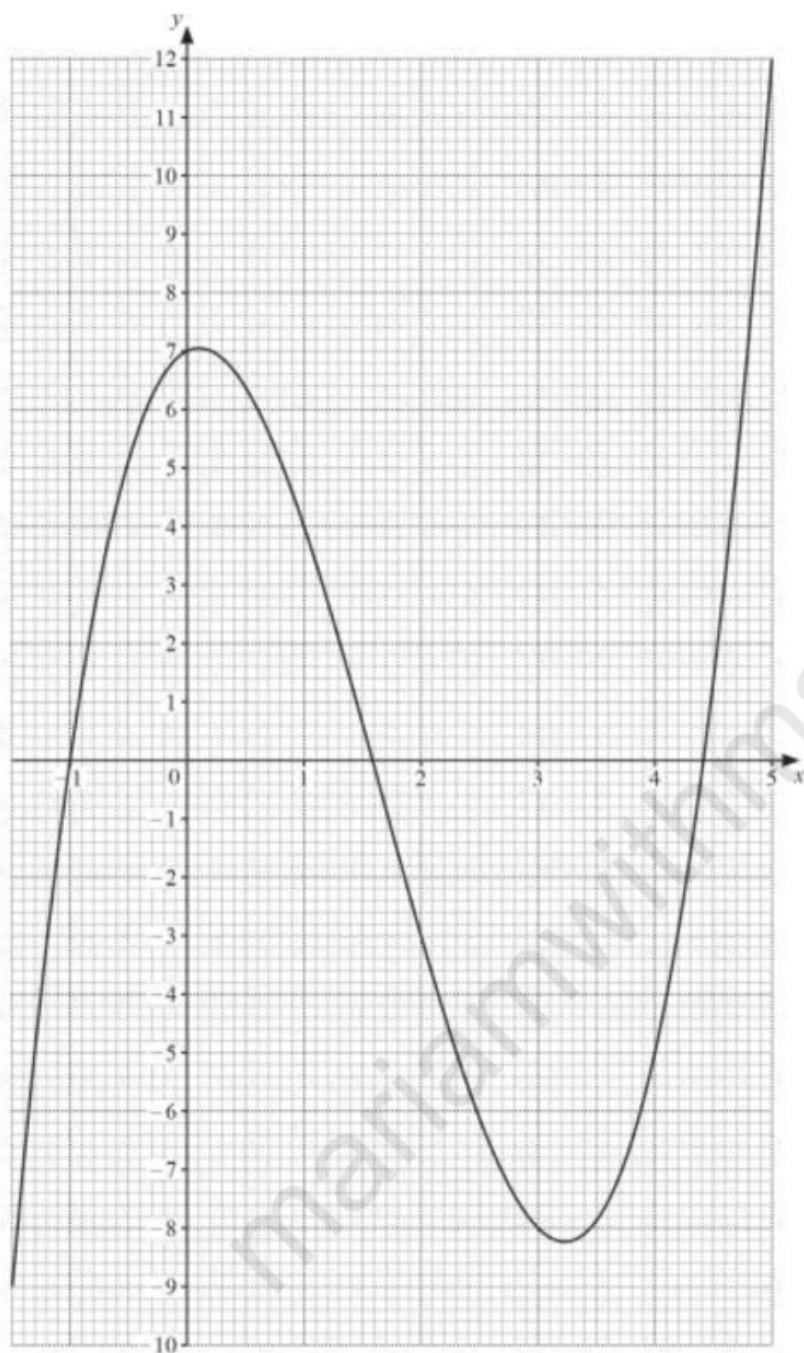


a) Find $f(1)$ [1] (b) Solve $f(x) = 3$. [1]

0580/41/M/J/17 Q4)



25. The diagram shows the graph of $y = f(x)$ for $-1.5 \leq x \leq 5$.



- (i) Find $f(2)$. [1]
- (ii) Solve the equation $f(x) = 0$ for $-1.5 \leq x \leq 5$. [3]
- (iii) $f(x) = k$ has three solutions for $-1.5 \leq x \leq 5$ where k is an integer. Find the smallest possible value of k . [1]
- (iv) On the grid, draw a line $y = mx$ so that $f(x) = mx$ has exactly one solution for $-1.5 \leq x \leq 5$. [2]

0580/41/M/J/22 Q6

Answers

1) (a)(i)169 (ii) $1 + 4x^2$ (iii) x (b)3.5	14) (a)0 (b)5 (c) $(x+1)/2$ (d) $9x + 16$ (e) $9x^2 + 24x + 16$ (f)27
2) (a)4(b)52(c) $7x^2 - 4$ (d) $\frac{7x^2-21x+12}{2x-6}$ (e)-3 (f)0,1	15) (a)2 (b)17 (c) $(x-1)/2$ (d) $4x^2 + 4x + 5$ (e) $\sqrt{2}$ (f)-1
3) (a) 82 (b) $(x+2)/7$ (c) 1 ,2 ,2 (d)6/7	16)) (a) 8 (b) 3 (c) $(x+1)/2$ (d) $4x - 3$ (e) $4x^2 - 4x + 7$ (f) x (g) $g^{-1}(x) = g(x)$ (h) $fh(x)$
4) (a)(i)1 (ii)8 (iii) $(10-x)/x$ (iv)5 (b) $\frac{-3x^2+5x+18}{x+1}$	17))(a)(i)10 (ii)-19 (b) $(1-x)/2$ (c)1/2 (d) $4x^2 - 8x + 2$ e)x (f)125 (g)25 (h)-2
5) (a)(i)26 (ii) $x^2 + 4x + 5$ (iii)5 (iv) $(x+3)/2$ (b)(i)27 (ii)4	18) (a)(i)4 (ii)16 (b)3 (c) $1/4$ (d) $\frac{5-x}{2}$ (e) $\frac{11x-x^2+2}{x}$ (f)a=1 , b=-21, c=100 (g) 32
6) (a)-11 (b)7 (c)25 (d) $9x^2 - 8x + 2$ (e) $(x+2)/3$	19) (a)-3 (b)12/11 (c) $64x - 45$ (d) $(x+5)/8$ (e) $\frac{8x^2+11x-13}{x+2}$ f(ii) 0.17 and 1.08
7) (a)-7 (b)4/64 (c) $(3-x)/2$ (e) 1.5	20) (a)(i)-3 (ii) $4/(5x+4)$ (iii) $(4+3x)/x$ (iv)2 b (ii) -1.57 and 3.17
8) (a)3 (b)-2/5 (c)- $2x - 7$ (d)26 (e) $(1-x)/2$ (f)-20 , 26	21) (a) (i) 5 (ii) $-2\frac{1}{3}$ (iii) $(x+3)/2$ or $x/2 + 1.5$ (iv) $4x - 9$ (v) $(2x-3)(x+1) = 1 + 2(x+1)$ (vi) 2.64 and - 1.14
9) (a)(i)11 (ii) $14x + 3$ (b) $17 - 21x$ (c)-1/9 (d)-1.3	22) (a) 2 (b) $1 - x$ (c) $x^2 - 2x + 2$ (d) - 6 (e) 0.38, 2.62 (f) $f(x)$ and $g(x)$
10) (a)1 (b)-0.2 oe (c) $9x + 8$ (d) $\frac{4x^2+5x-3}{x(2x-1)}$ (e) $h(x)$	23) (a)(i)-3 (ii) 6.2 to 6.4
11) (a)20 (b) $6x + 1$ (c) $x < 3$ (d)-2 (e) $(x+2)/3$ (f) $\frac{6x^2-x+3}{2x+1}$ (g)9	24) (a) -1.6 to -1.4 (b) -0.5
12) (a)(i)11 (ii)16 (b) $(x-5)/2$ (c) $19 - 6x$ (d)-1,0,1,2	25) (a) (i)-3 (ii)-1, 1.55 to 1.5, 4.4 to 4.45 (iii)-8 (iv) straight line through origin intersecting curve at one point only
13) (a)32 (b) $x + 21$ (c) -1	