

1. (a) (i) $\sqrt{6}$ A1 N1
- (ii) 9 A1 N1
- (iii) 0 A1 N1
- (b) $x < 5$ A2 N2
- (c) $(g \circ f)(x) = (\sqrt{x-5})^2$ (M1)
 $= x - 5$ A1 N2
2. (a) for interchanging x and y (may be done later) (M1)
e.g. $x = 2y - 3$
 $g^{-1}(x) = \frac{x+3}{2}$ (accept $y = \frac{x+3}{2}, \frac{x+3}{2}$) A1 N2
- (b) **METHOD 1**
 $g(4) = 5$ (A1)
 evidence of composition of functions (M1)
 $f(5) = 25$ A1 N3
- METHOD 2**
 $f \circ g(x) = (2x - 3)^2$ (M1)
 $f \circ g(4) = (2 \times 4 - 3)^2$ (A1)
 $= 25$ A1 N3
3. (a) **METHOD 1**
 For $f(-2) = -12$ (A1)
 $(g \circ f)(-2) = g(-12) = -24$ A1 N2
- METHOD 2**
 $(g \circ f)(x) = 2x^3 - 8$ (A1)
 $(g \circ f)(-2) = -24$ A1 N2
- (b) Interchanging x and y (may be done later) (M1)
 $x = y^3 - 4$ A1
 $f^{-1}(x) = \sqrt[3]{(x+4)}$ A2 N3

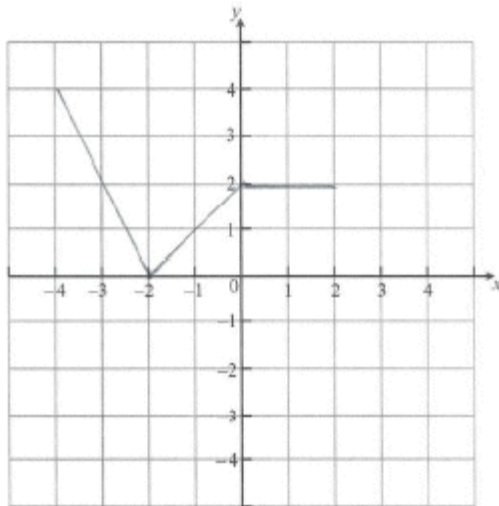
[7]

[5]

[6]

4. (a) Evidence of attempting to form composition (M1)
 Correct substitution $(h \circ g)(x) = \frac{5(3x-2)}{(3x-2)-4}$ A1
 $= \frac{5(3x-2)}{(3x-6)} \left(= \frac{15x-10}{3x-6} \right) \left(= \frac{5(3x-2)}{3(x-2)} \right)$ A1 N2
- (b) Evidence of using numerator = 0 (M1)
 eg $15x - 10 = 0$ ($3x - 2 = 0$)
 $x = \frac{2}{3}$ (=0.667) A2 N3
- [6]**
5. (a) $f^{-1}(2) \Rightarrow 3x + 5 = 2$ (M1)
 $x = -1$ (A1) (C2)
- (b) $g(f(-4)) = g(-12 + 5)$
 $= g(-7)$ (A1)
 $= 2(1 + 7)$
 $= 16$ (A1) (C2)
- [4]**
6. (a) in any order
 translated 1 unit to the right A1 N1
 stretched vertically by factor 2 A1 N1
- (b) **METHOD 1**
 Finding coordinates of image on g (A1)(A1)
 e.g. $-1 + 1 = 0$, $1 \times 2 = 2$, $(-1, 1) \rightarrow (-1 + 1, 2 \times 1)$, $(0, 2)$
 P is $(3, 0)$ A1A1 N4
- METHOD 2**
 $h(x) = 2(x - 4)^2 - 2$ (A1)(A1)
 P is $(3, 0)$ A1A1 N4
- [6]**

7. (a)



A2 N2

(b) evidence of appropriate approach

(M1)

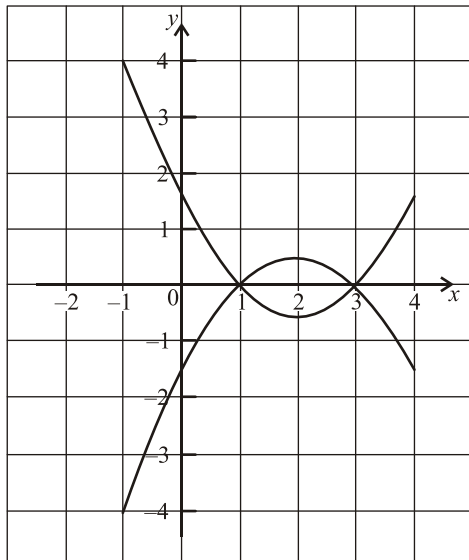
e.g. reference to any horizontal shift and/or stretch factor, $x = 3 + 1$, $y = \frac{1}{2} \times 2$

P is (4, 1) (accept $x = 4$, $y = 1$)

A1A1 N3

[5]

8. (a)



M1A1 N2

Note: Award M1 for evidence of reflection in x -axis, A1 for correct vertex **and** all intercepts approximately correct.

(b) (i) $g(-3) = f(0)$
 $f(0) = -1.5$

(A1)
 A1 N2

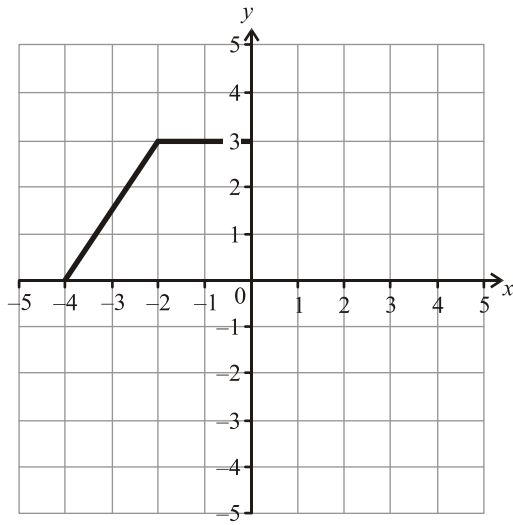
(ii) translation (accept shift, slide, etc.) of $\begin{pmatrix} -3 \\ 0 \end{pmatrix}$

A1A1 N2

[6]

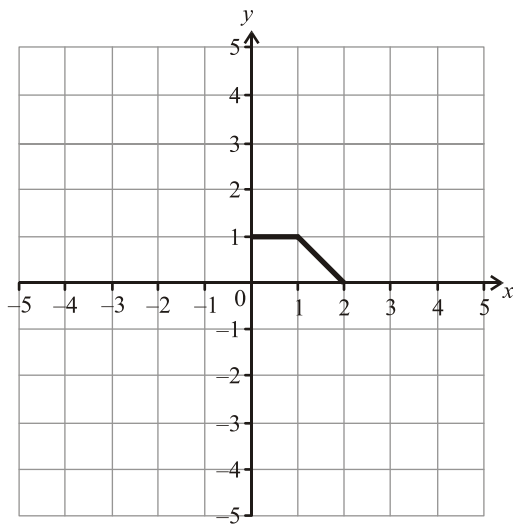
9. (a) (i) 3
(ii) 4
(b)

A1 N1
A1 N1



A2 N2

- (c)



A2 N2

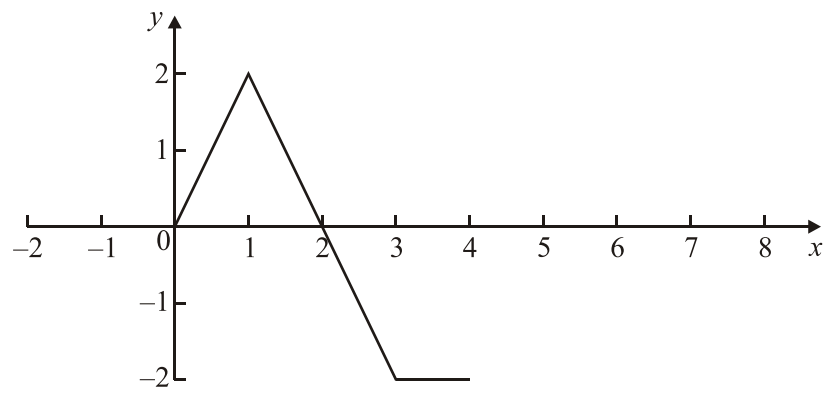
[6]

10. (a) D
(b) C
(c) A

11. (a) (i)

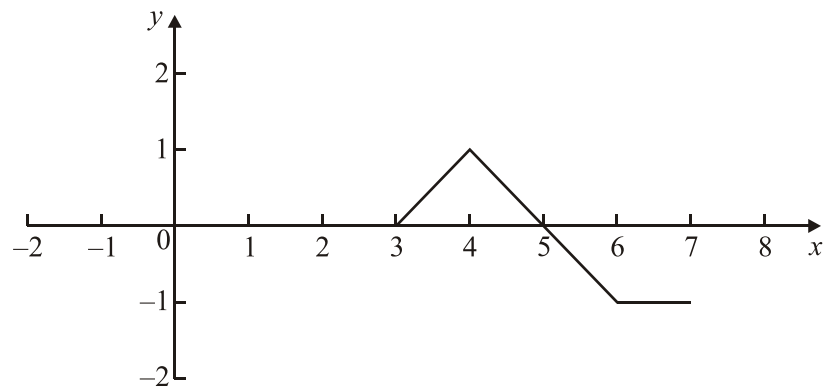
A2 N2
A2 N2
A2 N2

[6]



(A2) (C2)

(ii)



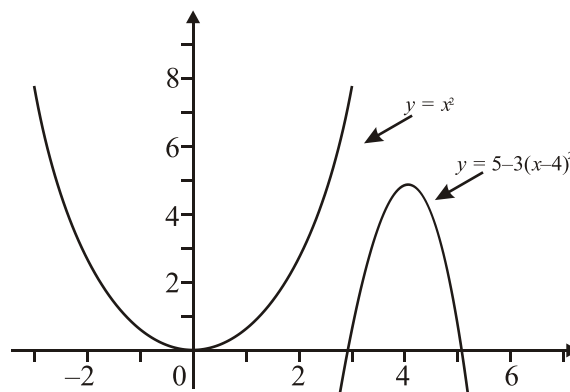
(A2) (C2)

(b) $A'(3, 2)$ (Accept $x = 3, y = 2$)

(A1)(A1) (C2)

[6]

12.



$q = 5$
 $k = 3, p = 4$

(A1) (C1)
 (A3) (C3)

[4]

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

x	0	1	2	3
$x-1$	-1	0	1	2
$f(x-1)$	3	2	0	1

$g(0) = 2f(-1) = 6$

(A1) (C1)

$g(1) = 2f(0) = 4$

(A1) (C1)

$g(2) = 2f(1) = 0$

(A1) (C1)

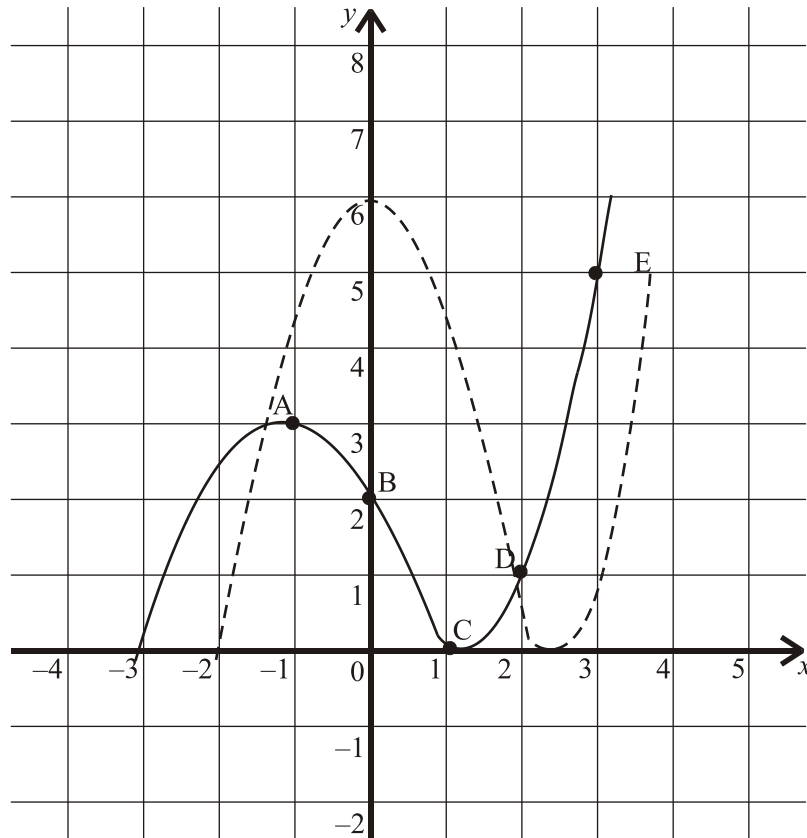
$g(3) = 2f(2) = 2$

(A1) (C1)

- (b) Graph passing through (0, 6), (1, 4), (2, 0), (3, 2)
Correct shape.

(A1)

(A1)



(C2)