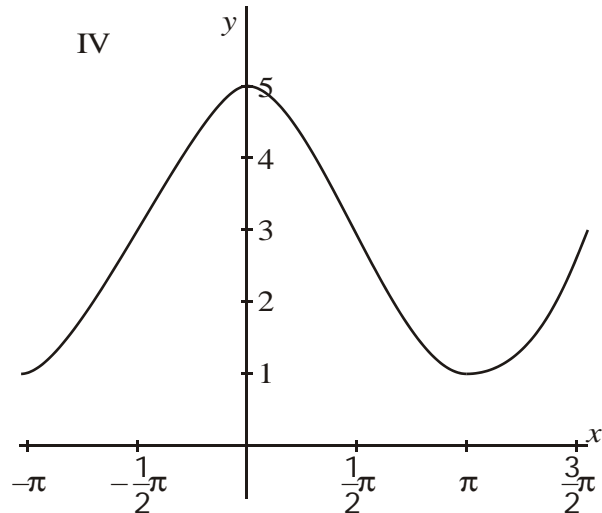
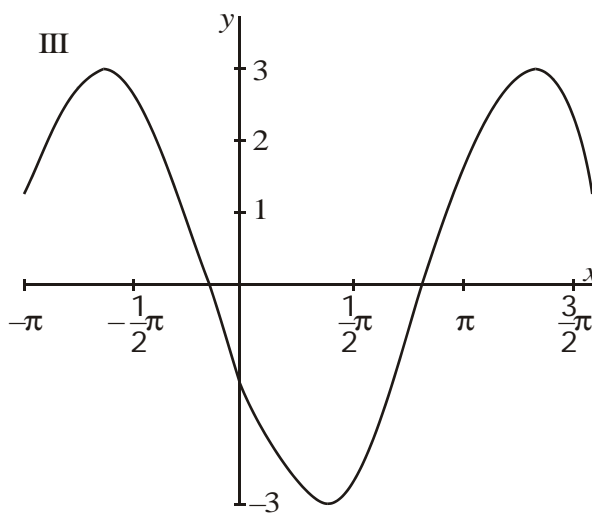
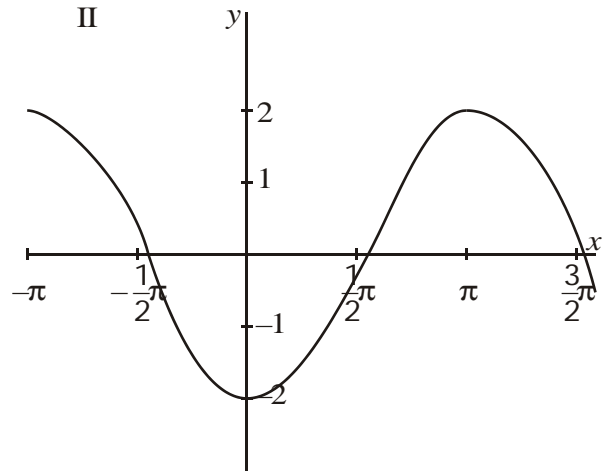
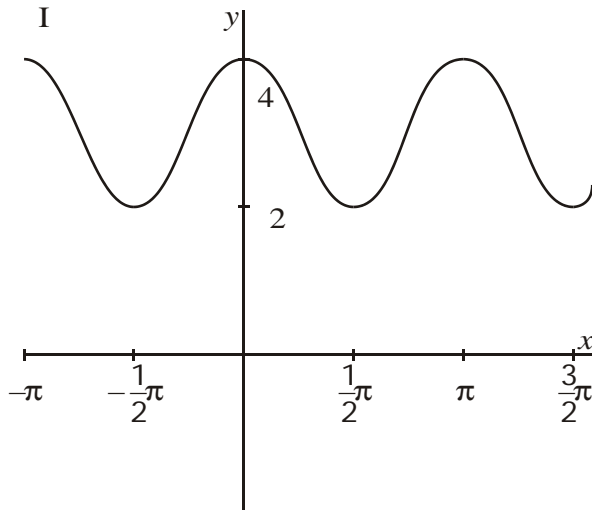


Transformations – Practice Problems

1. Three of the following diagrams I, II, III, IV represent the graphs of
- (a) $y = 3 + \cos 2x$
 - (b) $y = 3 \cos (x + 2)$
 - (c) $y = 2 \cos x + 3.$

Identify which diagram represents which graph.



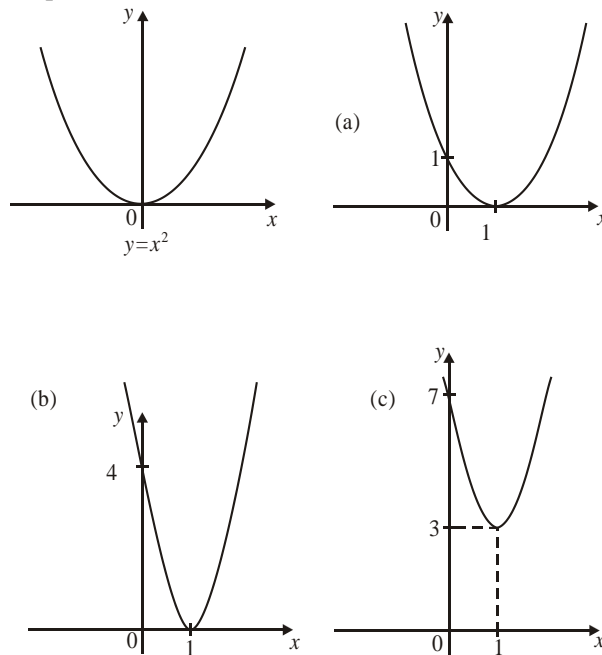
Working:

Answers:

- (a)
- (b)
- (c)

(Total 4 marks)

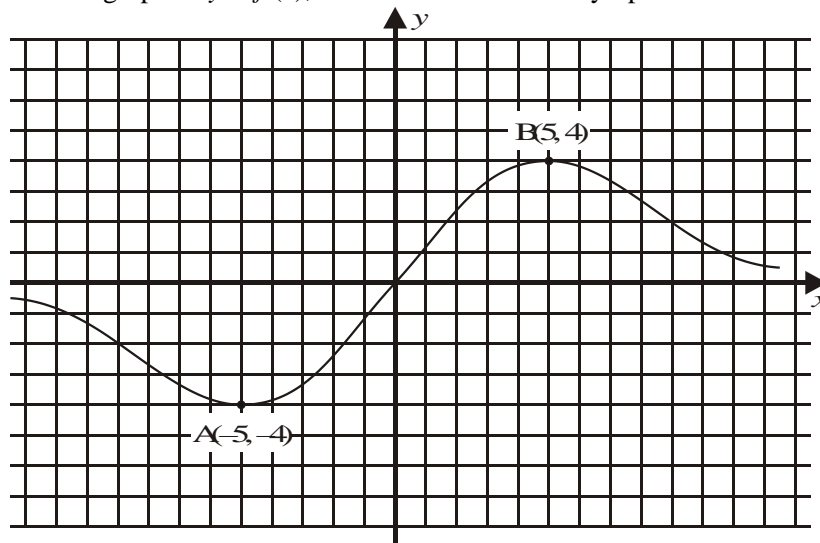
2. The diagrams show how the graph of $y = x^2$ is transformed to the graph of $y = f(x)$ in three steps. For each diagram give the equation of the curve.



<p><i>Working:</i></p>	<p><i>Answers:</i></p> <p>(a)</p> <p>(b)</p> <p>(c)</p>
------------------------	---

(Total 4 marks)

3. The diagram shows the graph of $y = f(x)$, with the x -axis as an asymptote.



- (a) On the same axes, draw the graph of $y = f(x + 2) - 3$, indicating the coordinates of the images of the points A and B.
- (b) Write down the equation of the asymptote to the graph of $y = f(x + 2) - 3$.

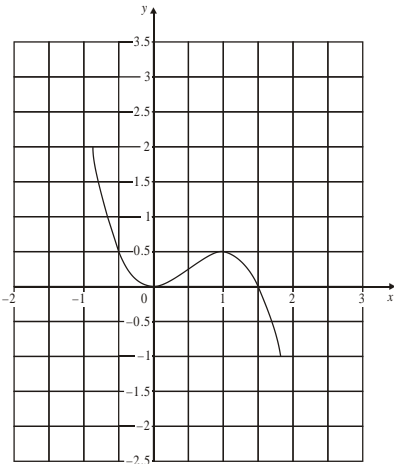
<p><i>Working:</i></p>	<p><i>Answer:</i></p> <p>(b)</p>
------------------------	--

(Total 4 marks)

4. The following diagram shows the graph of $y = f(x)$. It has minimum and maximum points at $(0, 0)$ and $(1, \frac{1}{2})$.

(a) On the same diagram, draw the graph of $y = f(x - 1) + \frac{3}{2}$.

(b) What are the coordinates of the minimum and maximum points of $y = f(x - 1) + \frac{3}{2}$?

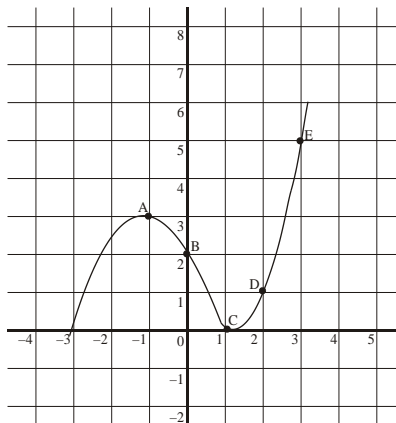


Working:

Answer:
 (b)

(Total 4 marks)

5. The sketch shows part of the graph of $y = f(x)$ which passes through the points A(-1, 3), B(0, 2), C(1, 0), D(2, 1) and E(3, 5).



A second function is defined by $g(x) = 2f(x - 1)$.

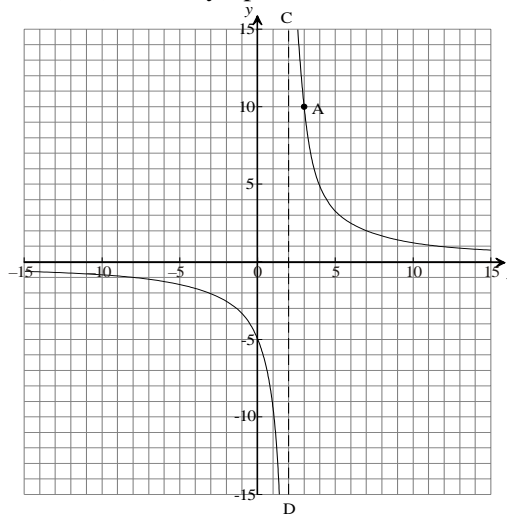
- (a) Calculate $g(0)$, $g(1)$, $g(2)$ and $g(3)$.
- (b) On the same axes, sketch the graph of the function $g(x)$.

Working:

Answers:
 (a)

(Total 6 marks)

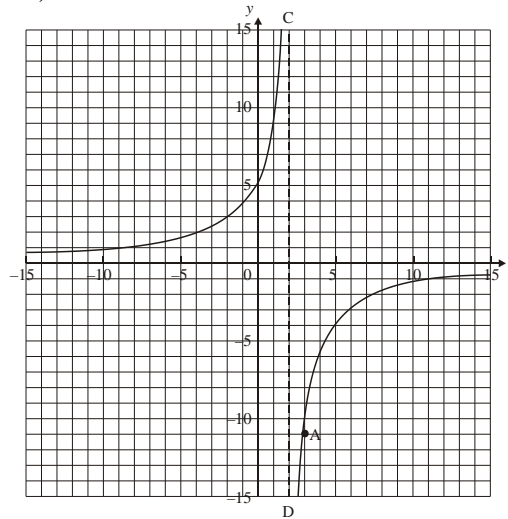
6. (a) The diagram shows part of the graph of the function $f(x) = \frac{q}{x-p}$. The curve passes through the point A (3, 10). The line (CD) is an asymptote.



Find the value of

- (i) p ;
- (ii) q .

- (b) The graph of $f(x)$ is transformed as shown in the following diagram. The point A is transformed to $A'(3, -10)$.



Give a full geometric description of the transformation.

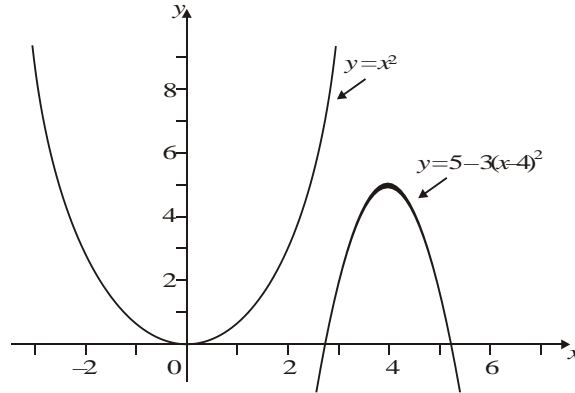
Working:

Answers:

- (a) (i)
- (ii)
- (b)
-

(Total 6 marks)

7. The diagram shows parts of the graphs of $y = x^2$ and $y = 5 - 3(x - 4)^2$.



The graph of $y = x^2$ may be transformed into the graph of $y = 5 - 3(x - 4)^2$ by these transformations.

- A reflection in the line $y = 0$ **followed by**
- a vertical stretch with scale factor k **followed by**
- a horizontal translation of p units **followed by**
- a vertical translation of q units.

Write down the value of

- (a) k ;
- (b) p ;
- (c) q .

Working:

Answers:

(a)

(b)

(c)

(Total 4 marks)

Transformations – Practice Problems - Markscheme

1. (a) I
 (b) III
 (c) IV

Note: Award (C4) for 3 correct, (C2) for 2 correct, (C1) for 1 correct.

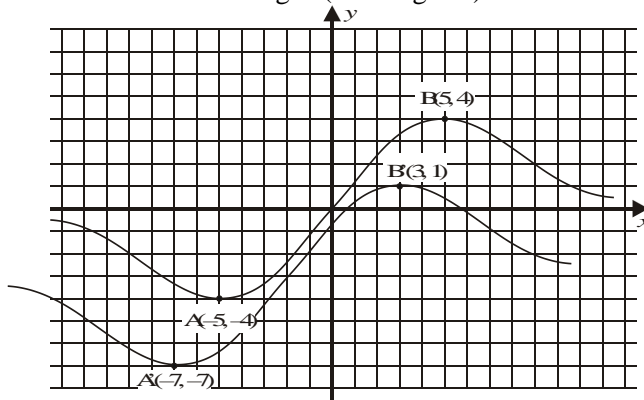
[4]

2. (a) $y = (x - 1)^2$ (A2)(C2)
 (b) $y = 4(x - 1)^2$ (A1) (C1)
 (c) $y = 4(x - 1)^2 + 3$ (A1) (C1)

Note: Do not penalize if these are correctly expanded.

[4]

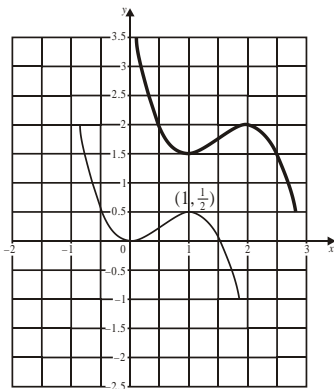
3. (a) Correct vertical shift (A1)
 Coordinates of the images (see diagram) (A1) (A1)



- (b) Asymptote: $y = -3$ (A1)

[4]

4. (a)



(A2)(C2)

- (b) Minimum: $(1, \frac{3}{2})$ (A1) (C1)
 Maximum: $(2, 2)$ (A1) (C1)

[4]

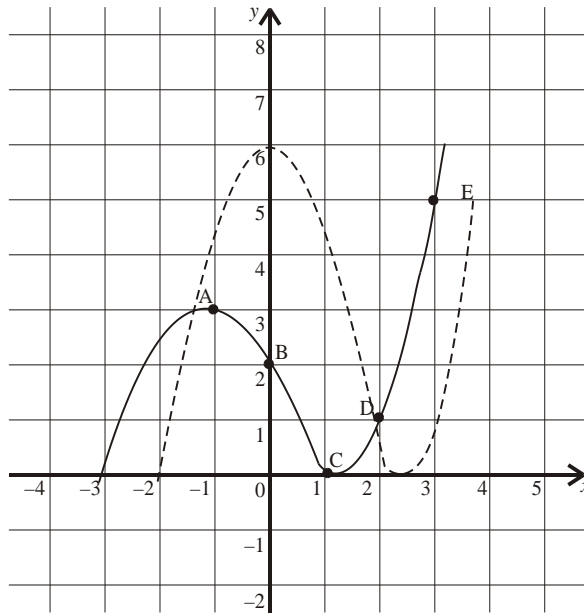
5. (a) $g(x) = 2f(x - 1)$

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)

[6]

6. (a) (i) $p = 2$
 (ii) $10 = \frac{q}{3 - 2}$ (or equivalent)
 $q = 10$

(A2)(C2)

(M1)

(A1)

(C2)

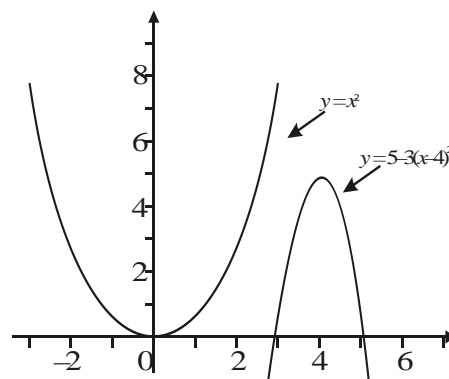
- (b) Reflection, in x -axis

(A1)(A1)

(C2)

[6]

7.



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

(A1)(C1)

(A3)(C3)

[4]