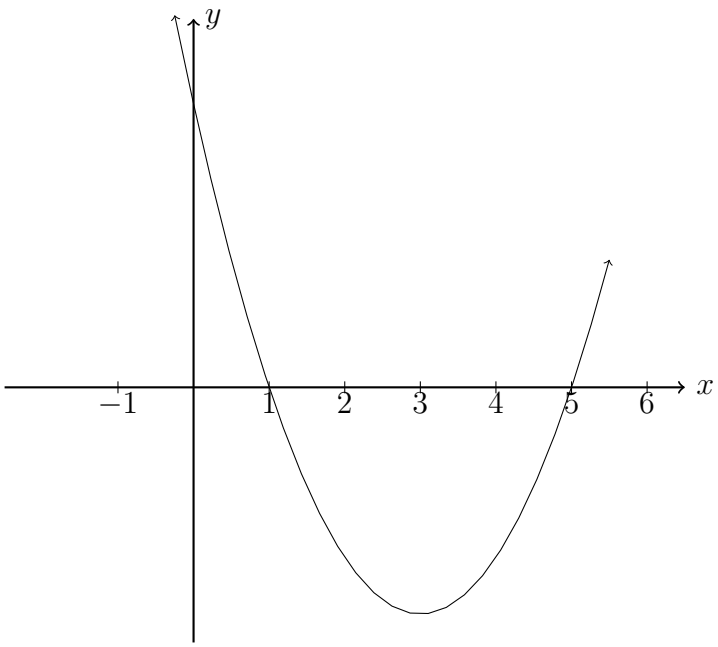
5.9 Exam: Graphing quadratic functions

1. A quadratic function f is shown with x-intercepts of 1 and 5, and vertex $(3, -4)$.



The function f can be written in the form $f(x) = (x - h)^2 + k$.

(a) Write down h and k. [2]

The function can also be written in the form $f(x) = a(x - a)(x - b)$

(b) Write down the value of a and b. [2]

(c) Find the y-intercept. [2]

Working:

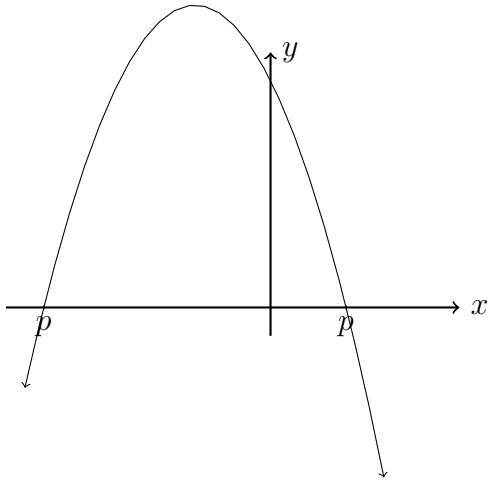
Answers:

(a) .....

(b) .....

(c) .....

2. Let $f(x) = a(x+3)(x-1)$. The following diagram shows part of the graph of f.



The graph has x-intercepts at $(p, 0)$ and $(q, 0)$, and a y-intercept at $(0, 12)$.

(a) Write down the value of p and of q. [2]

(b) Find the value of a.

(c) Find the equation of the axis of symmetry of the graph of f.

(d) Find the largest value of f.

The function f can be written in the form $f(x) = (x-h)^2 + k$.

(e) Write down the value of h and k. [3]

Working:

Answers:

(a) .....

(b) .....

(c) .....

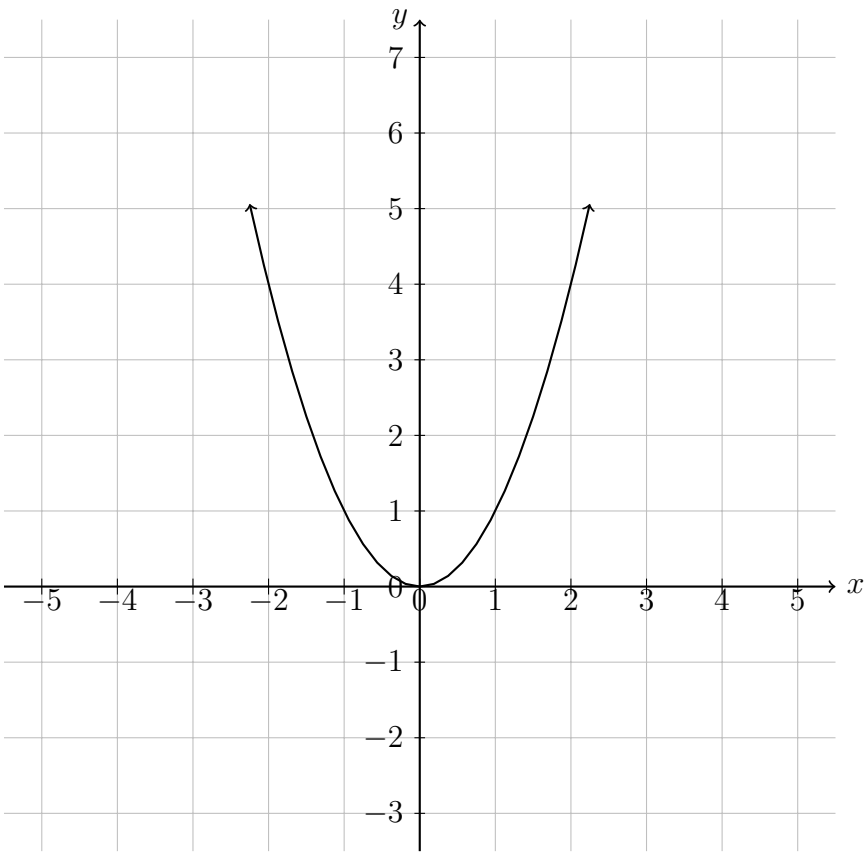
3. Graph the $f(x) = 2x^2 - 12x + 11$ on your calculator and use its functions to answer these questions.

   (a) Write down the coordinates of the vertex.

   (b) Hence or otherwise, express the function in the form $f(x) = 3(x - h)^2 + k$.

   (c) Solve the equation $f(x) = 0$.

4. The diagram below shows part of the graph of the function $f(x) = x^2$.



   (a) $g(x)$ is the image of f after a translation right 3 and down 1. Draw g.

   (b) g can be written in the form $g(x) = a(x - h)^2 + k$. Write down h and k.

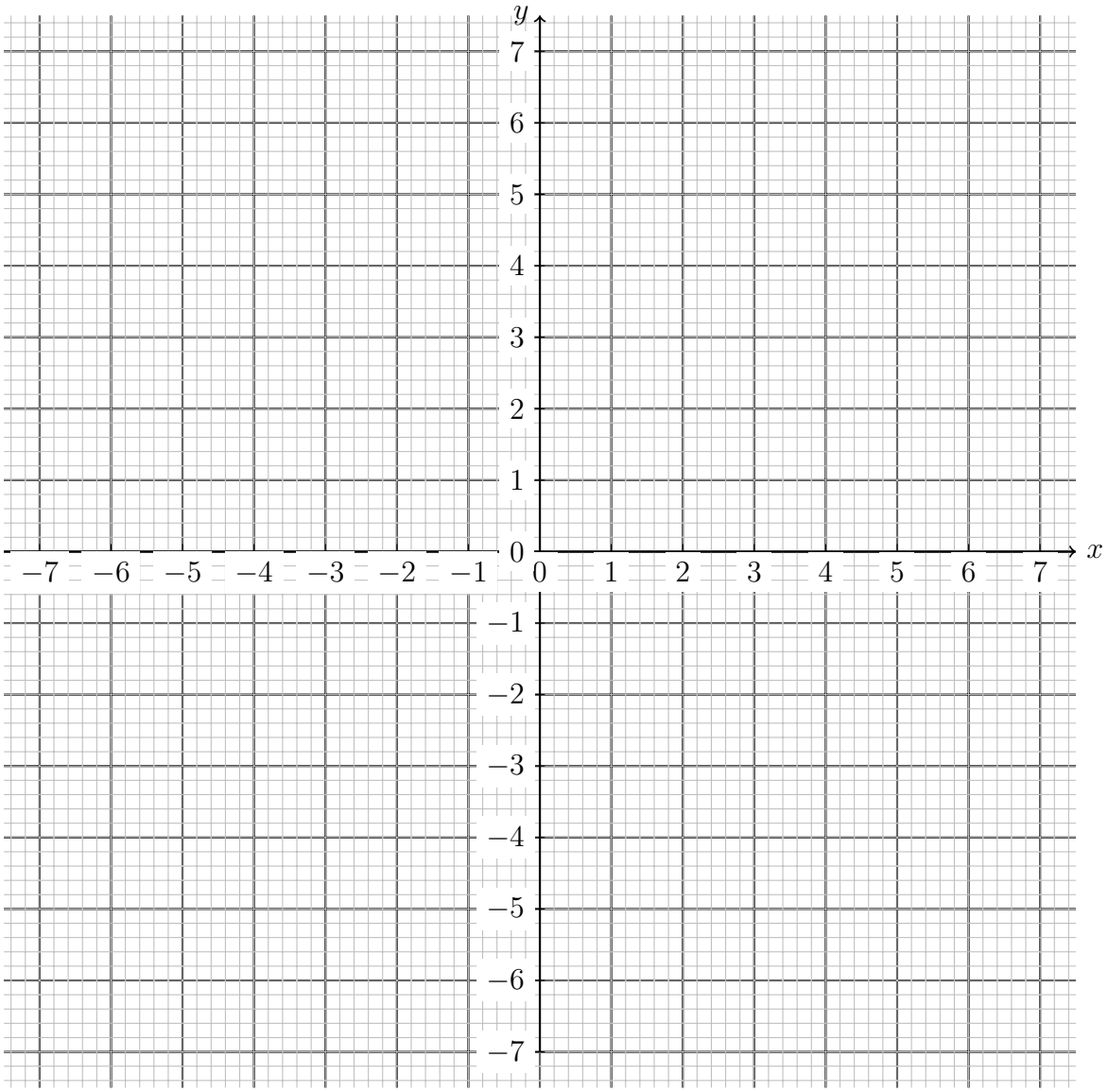
   (c) Expand g to standard form, $g(x) = ax^2 + bx + c$.

5. Graph the function $f(x) = x^2 + 2x + 2$ over the domain $-1 \leq x \leq 1$.

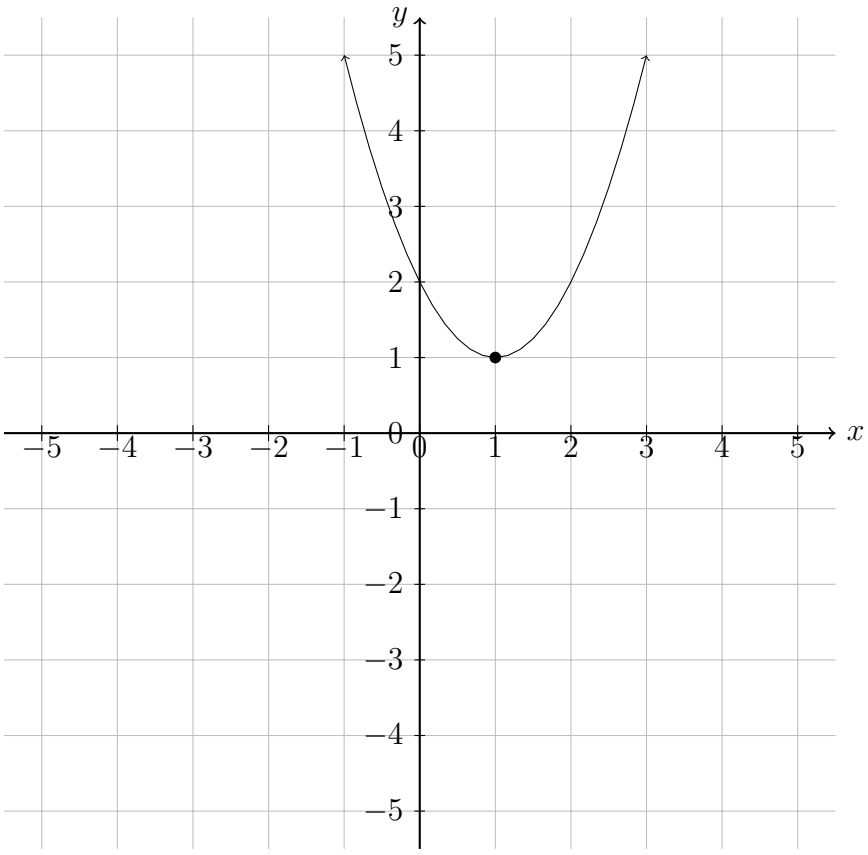
   (a) Mark points on the function representing $f(-1) = 1$ and $f(1) = 5$. Label them as coordinate pairs.

   (b) Graph and label the inverse of f, $f^{-1}(x)$, on the same axes over the domain corresponding to the range of f graphed. Mark the inverses of the points named in part (a), labeling them as coordinate pairs.

   (c) Write down the domain and range of $f^{-1}(x)$ in the space below.



6. Let f be a quadratic function. Part of the graph of f is shown below. The vertex is at $P(3, 2)$ and the y-intercept is at $Q(0, 5)$.

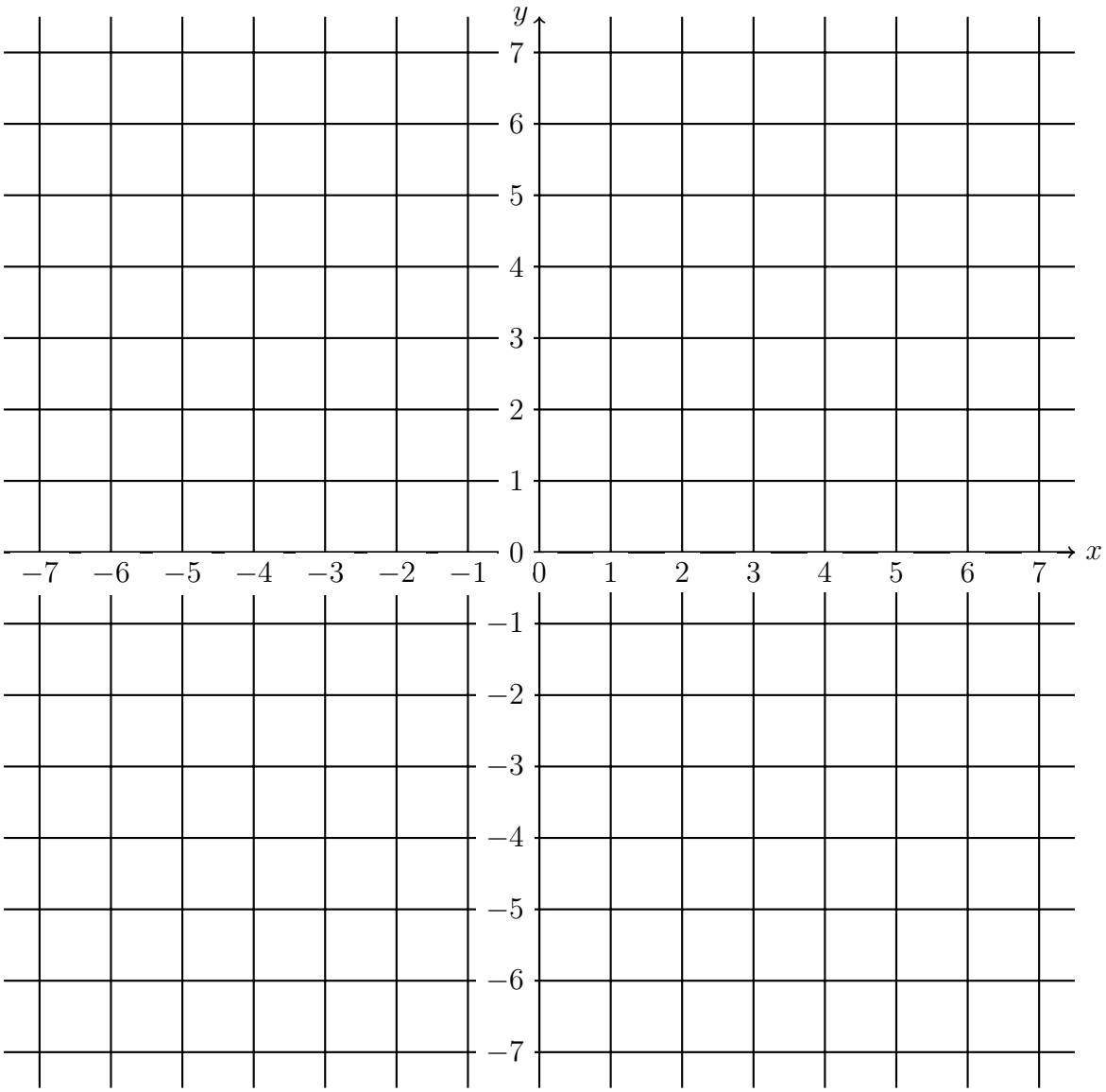


(a) Write down the equation of the axis of symmetry.

(b) The function f can be written in the form $f(x) = a(x - h)^2 + k$. Write down the value of h and of k.

(c) Find a.

7. The following diagram shows the graph of a function f.



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

(b) Find $(f \circ f)(-1)$.

(c) On the same diagram, sketch the graph of $y = -f(x)$.

8. The following diagram shows part of the graph of a quadratic function f.

Graphing calculators may be used on this section.

9. Let $f(x) = 2x^2 + 3x - 1$.

   (a) Write down the coordinates of the vertex.

   (b) Hence or otherwise, express the function in the form $f(x) = 2(x - h)^2 + k$.

   (c) Solve the equation $f(x) = 0$.

10. Consider the function $f(x) = x^2 - 6x - 1$.

    (a) Sketch the graph of f, for $-4 \leq x \leq 3$.

    (b) This function can also be written in the form $f(x) = (x - p)^2 - 10$.
    Write down the value of p.

    (c) The graph of g is obtained by reflecting the graph of f in the x-axis, followed by a translation of $(0, 4)$.
    Show that $g(x) = x^2 + 3x - 1$.

    (d) The graphs of f and g intersect at two points.
    Write down the x-coordinates of these two points.

11. Consider the equation $x^2 + (k-2)x = -4$, where k is a real number. Find the values of k for which the equation has two equal real solutions.