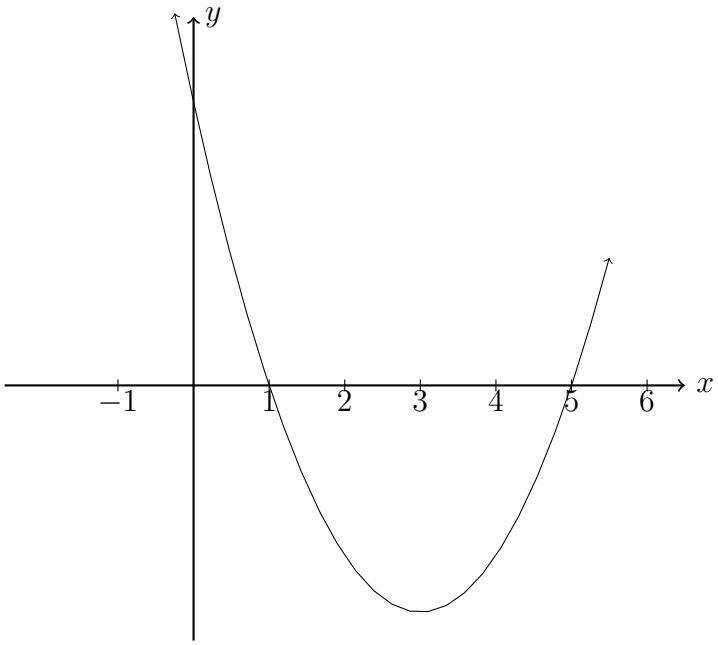
5.11 Exam: Quadratic functions and their graphs (no calculator)

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:

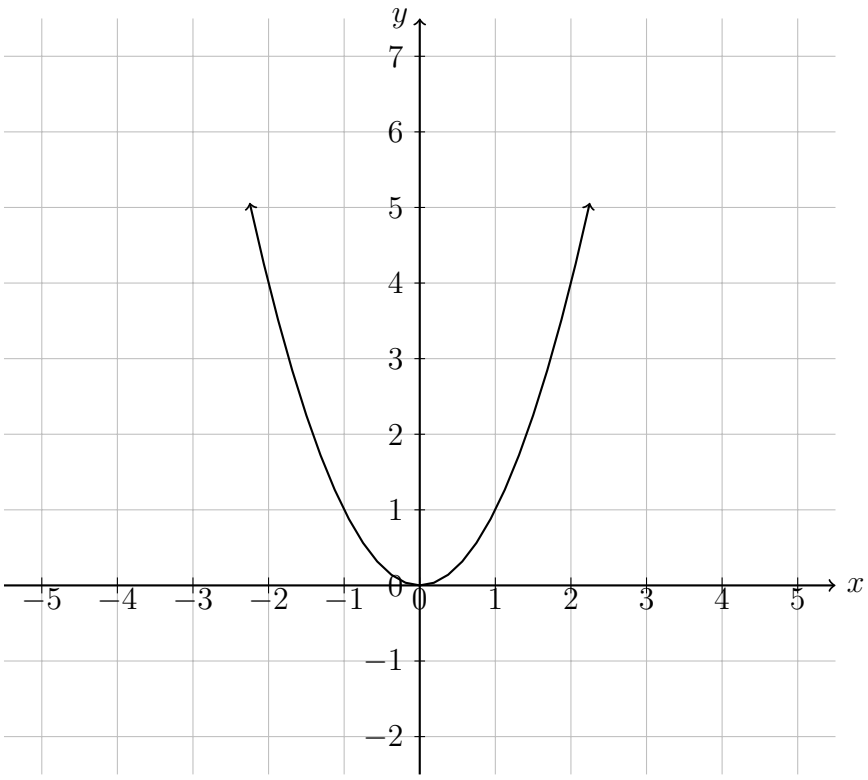
Answers:

(a) .....

(b) .....

(c) .....

2. 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 left 3 and up 1. Draw g. [2]

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

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

Working:

Answers:

(a) .....

(b) .....

(c) .....

3. Let $f(x) = x^2 + 2x + 1$ and $g(x) = x + 1$.

   (a) Write down $f(0)$. [1]

   (b) Find $(f - g)(x)$. [1]

   (c) Find $(f \div g)(x)$ in simplest form, $x \neq 0$. [2]

   (d) Write down $g^{-1}(4)$. [2]

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

   (f) Find $(f \circ g)(x)$. [2]

Working:

Answers:

(a) .....

(b) .....

(c) .....

(d) .....

(e) .....

(f) .....

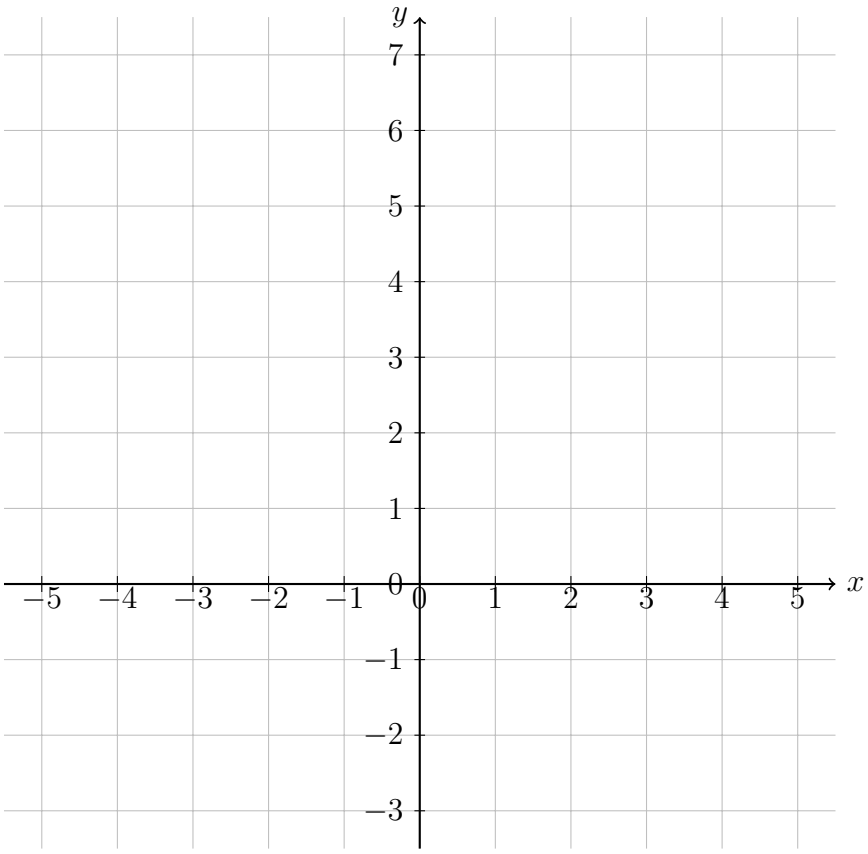
4. Let $f(x) = x^2 - 6x + 7$. f can be written in the form $f(x) = (x - h)^2 + k$.

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

   (b) Write down the equation of the axis of symmetry. [1]

   (c) Find the solutions of $f(x) = 0$. [2]

   (d) Draw the function $f(x)$ on the grid below. [2]



Working:

Answers:

(a) .....

(b) .....

(c) .....

5. Consider $f(x) = x^2 + qx + r$. The graph of f has a minimum value when $x = -1.5$. The distance between the two zeros of f is 9.

   (a) Show that the two zeros are 3 and -6. [2]

   (b) Find the value of q and r. [4]

Working:

Answers:

(b) .....

6. 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. [7]

Working:

Answers:

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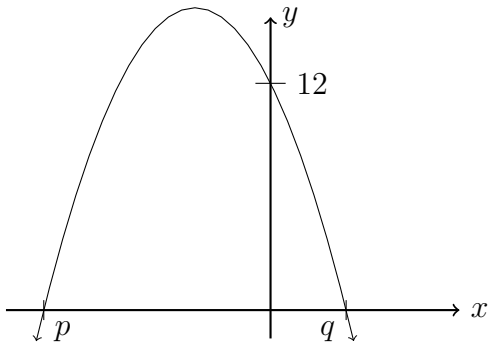
7. Let $f(x) = a(x+3)(x-1)$. The following diagram shows part of the graph of f.



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. [3]

(c) Find the equation of the axis of symmetry of the graph of f. [3]

(d) Find the largest value of f.

The function f can be written in the form $f(x) = (x-h)^2 + k$. [3]

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

Working:

Answers:

(a) .....

(b) .....

(c) .....

(d) .....

(e) .....