

3.2 Graphing quadratic functions

Useful forms of equations for quadratics:

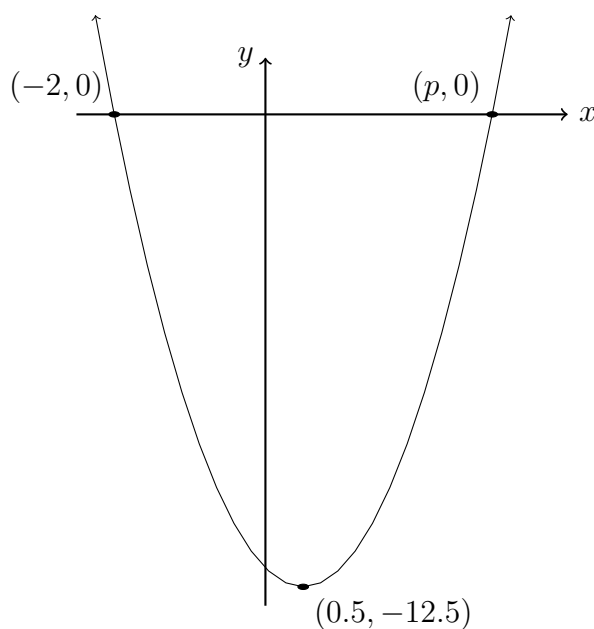
$$f(x) = ax^2 + bx + c, \text{ with } y\text{-intercept } c, \text{ axis of symmetry } x = -\frac{b}{2a}, \text{ zeros } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$g(x) = a(x - p)(x - q), \text{ with } x\text{-intercepts } p, q \text{ and axis of symmetry } x = \frac{p + q}{2}$$

$$h(x) = a(x - h)^2 + k, \text{ with vertex } (h, k)$$

1. Consider the function $f(x) = ax^2 + bx + c$. The graph of $y = f(x)$ is shown in the diagram. The vertex of the graph has coordinates $(0.5, -12.5)$. The graph intersects the x -axis at the two points, $(-2, 0)$ and $(p, 0)$.

diagram not to scale



- (a) Find the value of p .
- (b) Find the value of:
 - i. a .
 - ii. b .
 - iii. c .
- (c) Write down the equation of the axis of symmetry.

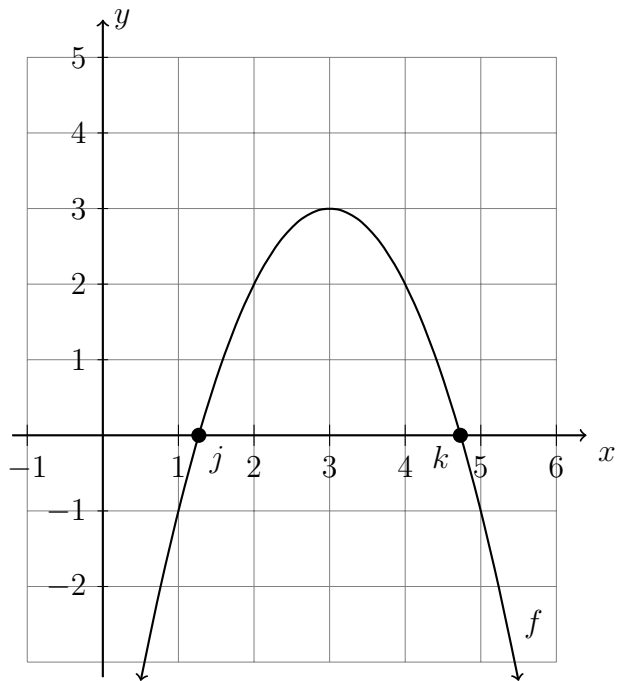
2. Do Now: The function $f(x) = -x^2 + 6x - 6$ is shown on the graph.

(a) Write down its vertex as an ordered pair.

(b) Write down the domain and range of f .

(c) Draw on the graph the function $g(x) = -x + 4$.

(d) Write down the two ordered pairs that satisfy both f and g .



(e) Find the exact values of j and k , the x -intercepts of f . (as an expression with radicals, not a decimal)

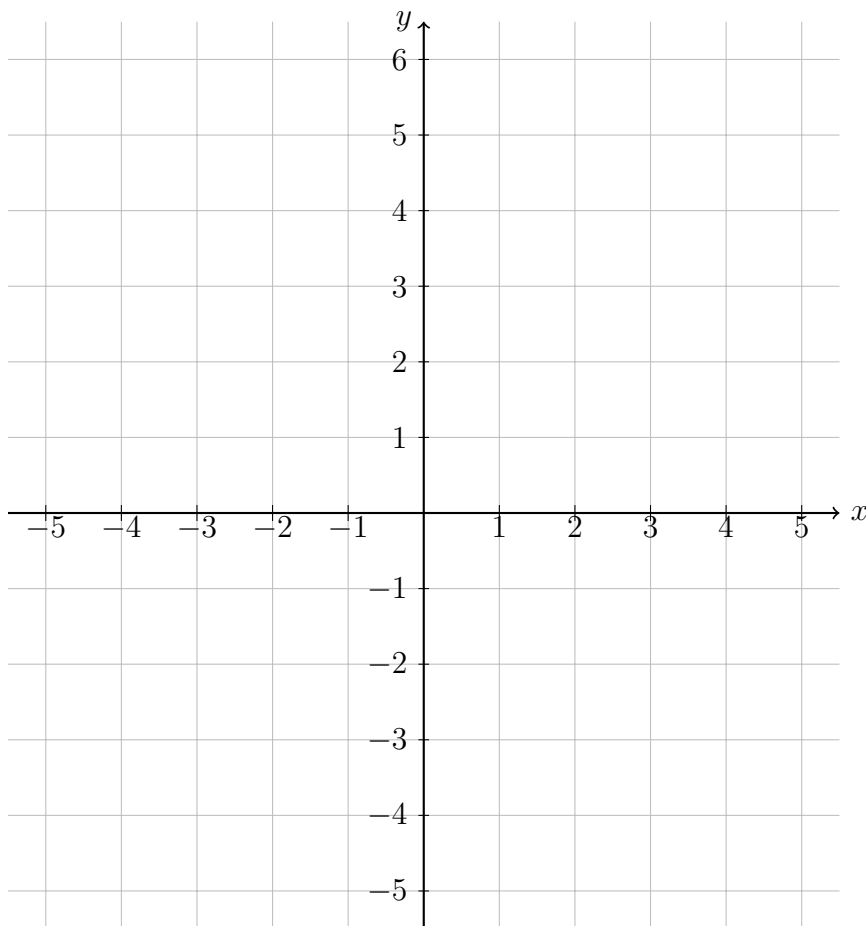
3. Consider the function $f(x) = x^2 + 2x - 3$.

(a) Sketch the graph of f , for $-4 \leq x \leq 2$. Label the vertex and the intercepts.

(b) This function can also be written in the form $f(x) = (x - p)^2 - 4$.
Write down the value of p .

(c) The graph of f has two solutions for $f(x) = 0$. Write down the solutions (or roots, zeros) of the function.

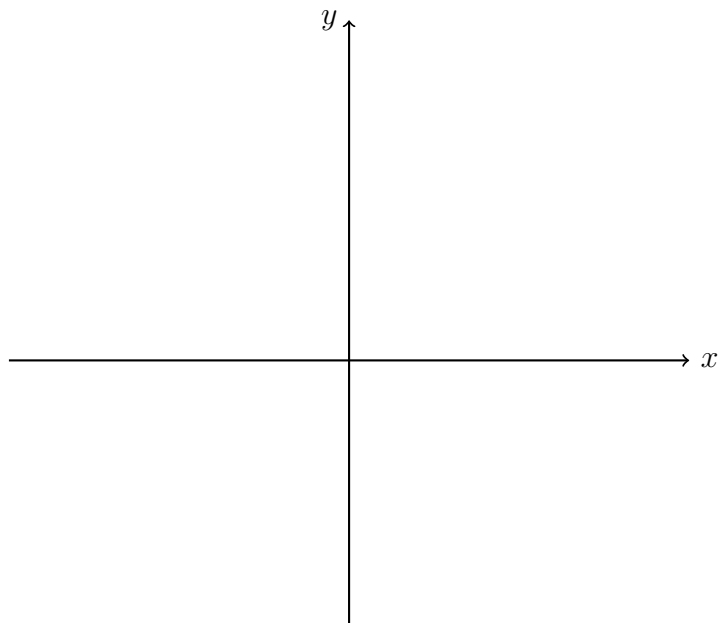
(d) Hence, write down the function in factored form, $f(x) = (x - a)(x - b)$.



Sketching a quadratic function

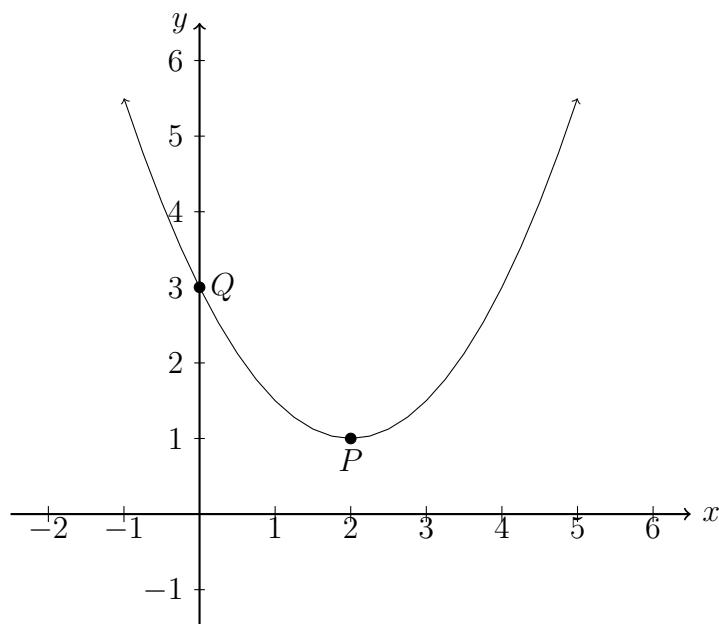
4. Given $f(x) = (x - 3)^2 - 4$

- (a) Write down the vertex of the function as an ordered pair.
- (b) Expand the function from vertex form to standard form, $ax^2 + bx + c$ where $a, b, c \in \mathbb{R}$.
- (c) Write down the value of $f(0)$. Explain what this represents on the graph.
- (d) Factor the function. Write down the roots.
- (e) Sketch the function, labeling the intercepts with values and the vertex as an ordered pair. Show the axis of symmetry as a dotted line and label it with its equation.



- (f) Write down the domain and range of the function.

5. Let f be a quadratic function. Part of the graph of f is shown below.
The vertex is at $P(2, 1)$ and the y -intercept is at $Q(0, 3)$.



- (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 .