$\rm BECA$ / IB Math 03-Quadratic functions 4 January 2022

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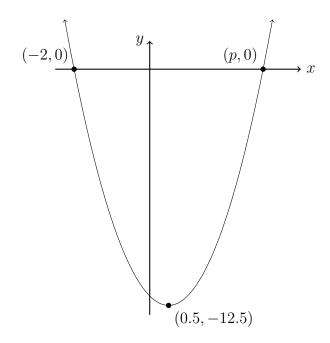
3.2 Graphing quadratic functions

Useful forms of equations for quadratics:

$$f(x) = ax^2 + bx + c$$
, with y-intercept c, axis of symmetry $x = -\frac{b}{2a}$, zeros $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $g(x) = a(x-p)(x-q)$, with x-intercepts p, q and axis of symmetry $x = \frac{p+q}{2}$ $h(x) = a(x-h)^2 + k$, with vertex (h,k)

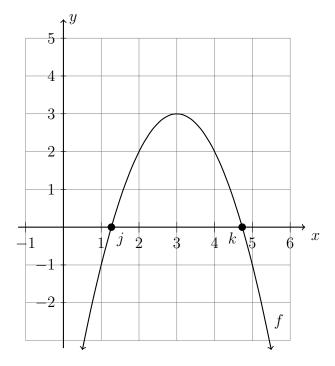
1. Consider the function $f(x) = ax^2 + bx + c$. The graph of y = f(x) is shown in the diagram. The vertex of the graph has coordinates (0.5, -12.5). The graph intersects the x-axis at the two points, (-2,0) and (p,0).

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.

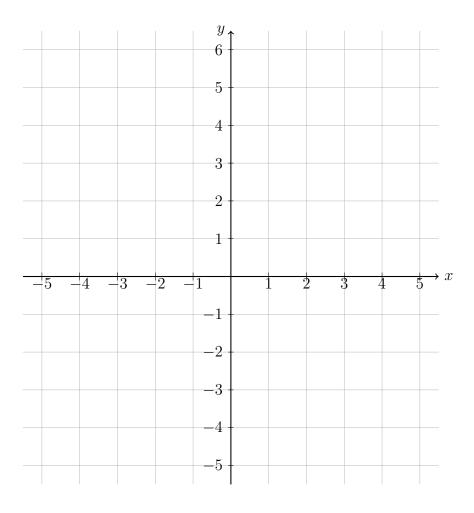


(e) Find the exact values of j and k, the x-intercepts of f. (as an expression with radicals, not a decimal)

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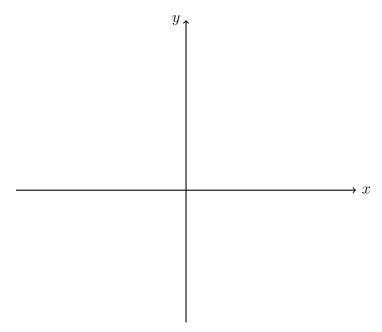
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- 3. Consider the function $f(x) = x^2 + 2x 3$.
 - (a) Sketch the graph of f, for $-4 \le x \le 2$. Label the vertex and the intercepts.
 - (b) This function can also be written in the form $f(x) = (x p)^2 4$. Write down the value of p.
 - (c) The 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).



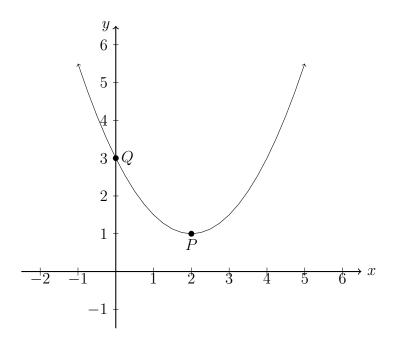
Sketching a quadratic function

- 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.