BECA / IB Math 03-Quadratic functions                    Name:
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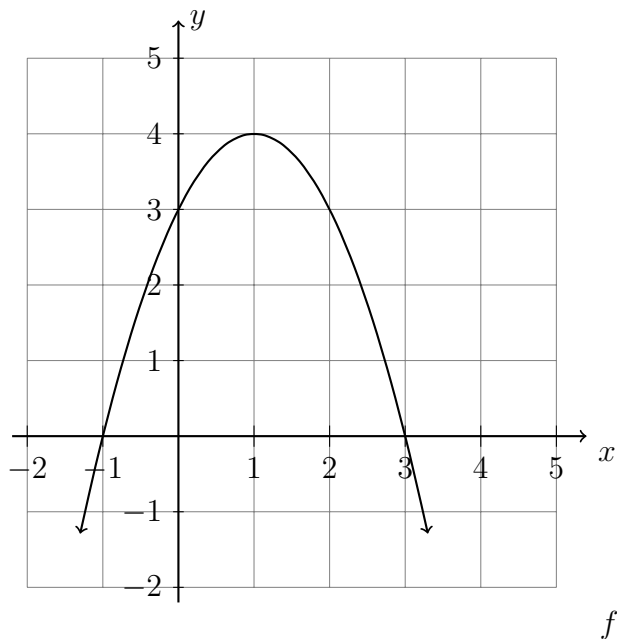## 3.4 Graphing quadratic functions

1. The function $f(x) = -x^2 + 2x + 3$ is shown on the graph.

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

   (b) Write down $f(0)$.

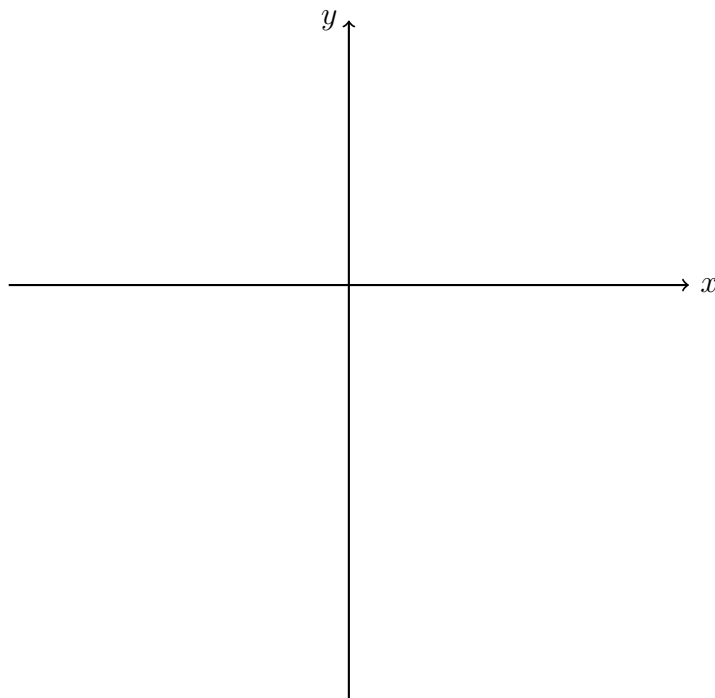   (c) Write down two solutions to $f(x) = 0$.



   (d) Hence or otherwise, write $f$ in the form $f(x) = a(x - p)(x - q)$

2. Given $f(x) = (x + 2)(x - 6)$

   (a) Sketch the function. Label the vertex as an ordered pair and mark the intercepts with their values.

   (b) Expand the function to standard form, $f(x) = ax^2 + bx + c$ where $a, b, c \in \mathbb{R}$.
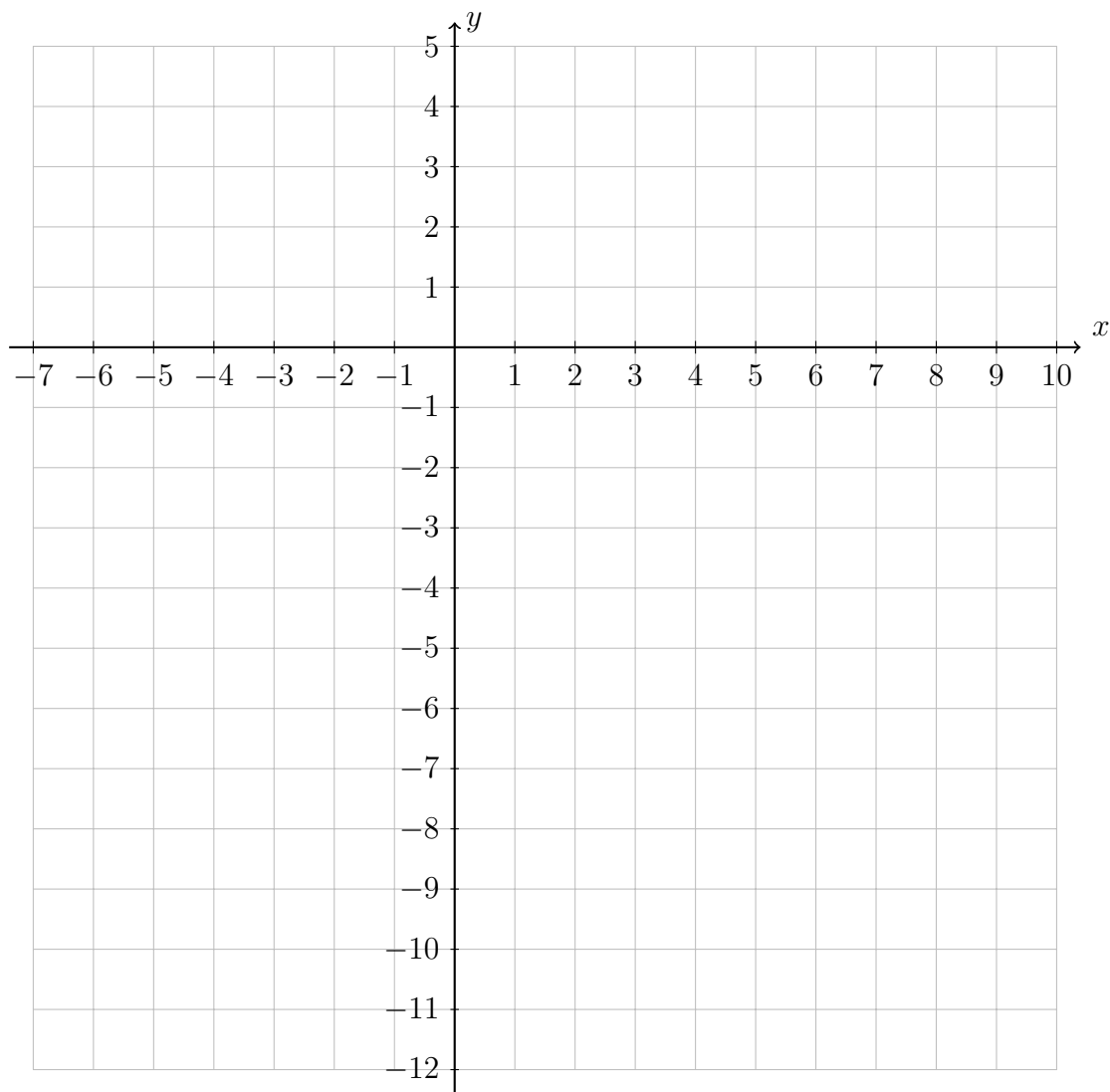
3. Consider the graph given by the equation $y = 0.4x^2 - 2x - 8$.

(a) Find the coordinates where the graph crosses the $x$-axis.

(b) Find the coordinates of the intercept with the $y$-axis.

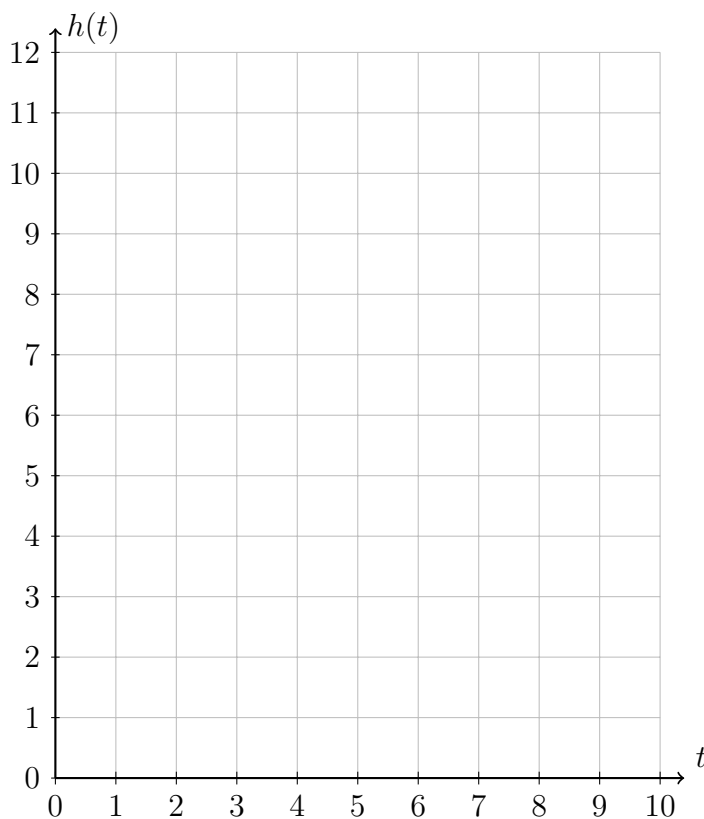(c) Find the equation of the axis of symmetry of the curve.

(d) Sketch the graph and the axis of symmetry, marking the intercepts and vertex.

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4. A ball is thrown vertically upwards.

   The path of the ball can be modelled by the equation $h(t) = 12t - 4t^2$ where $h(t)$ is the height of the ball after $t$ seconds.

   (a) Plot a graph of this equation and hence sketch it below, showing the coordinates of the vertex and axes intercepts.

   (b) Find the $t$-intercepts and explain what these values represent.

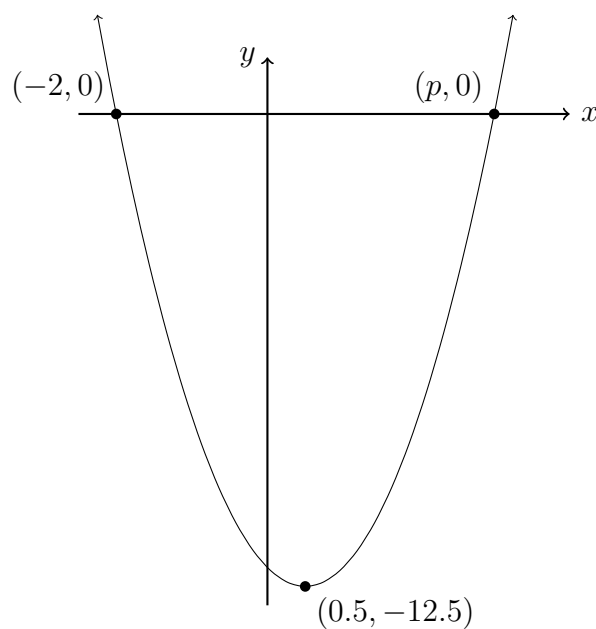   (c) Find the equation of the axis of symmetry, and state what this tells you in the context of the problem.

5. Let $f$ be a quadratic function. Part of the graph of $f$ is shown below. The vertex is at $P(4, 2)$ and the $y$-intercept is at $Q(0, 6)$.
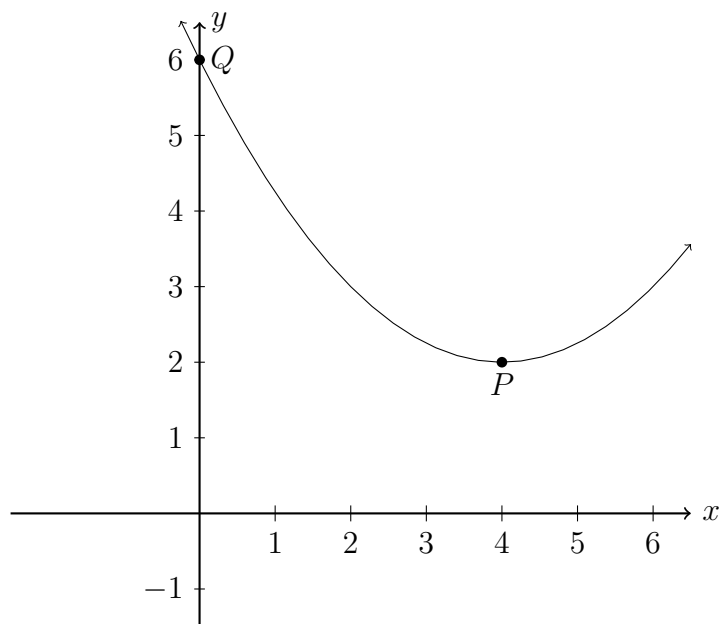


(a) Write down the equation of the axis of symmetry.

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

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

(d) Find $a$.

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6. 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.