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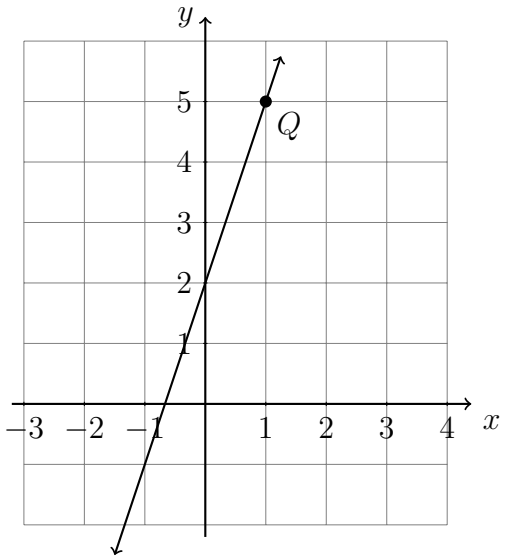
3.8 Quiz: Linear and quadratic functions

1. A linear function f is graphed below.



   (a) Write down it's slope.
   $m =$

   (b) Write down it's y-intercept.
   $b =$

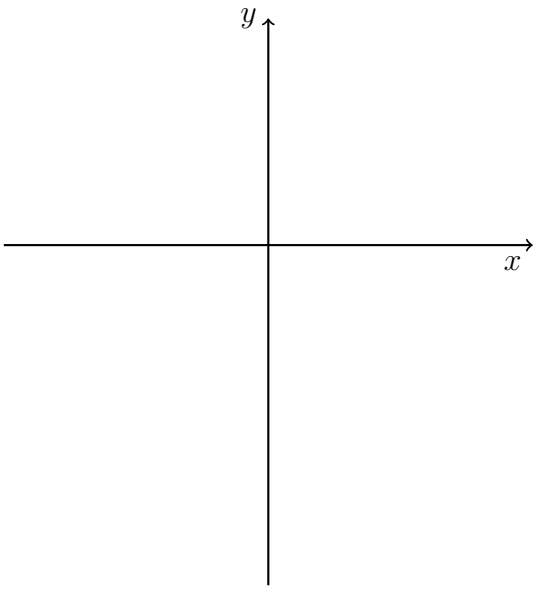
   (c) Write down the equation of the line.

   (d) State the coordinates of the point Q.

2. Write the linear equation $y - 2 = \frac{1}{4}(x + 8)$ in the form $y = mx + c$.

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

   (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 $a, b, c \in \mathbb{R}$.

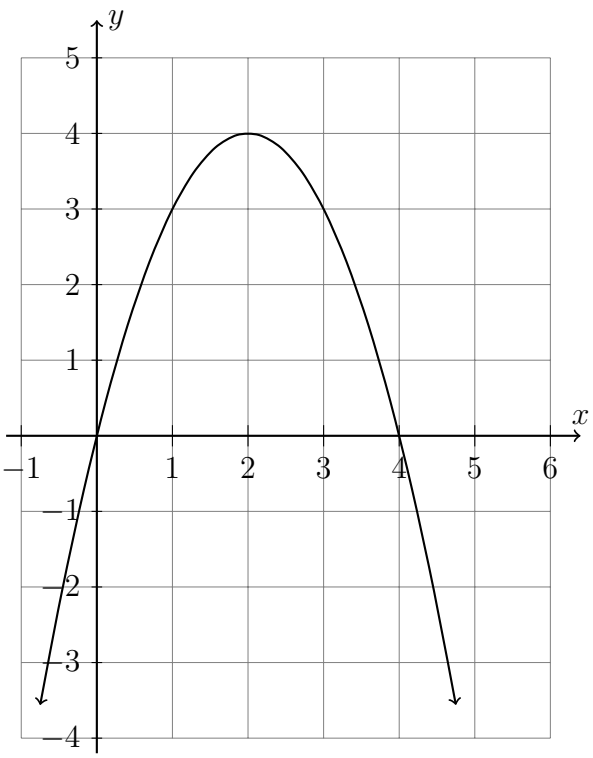
4. The function $f(x) = -x^2 + 4x$ is shown on the graph.

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

   (b) Write down its domain and range.

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

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



5. Consider the function $f(x) = x^2 + 2x - 3$. (graph it to answer the questions)

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

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

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

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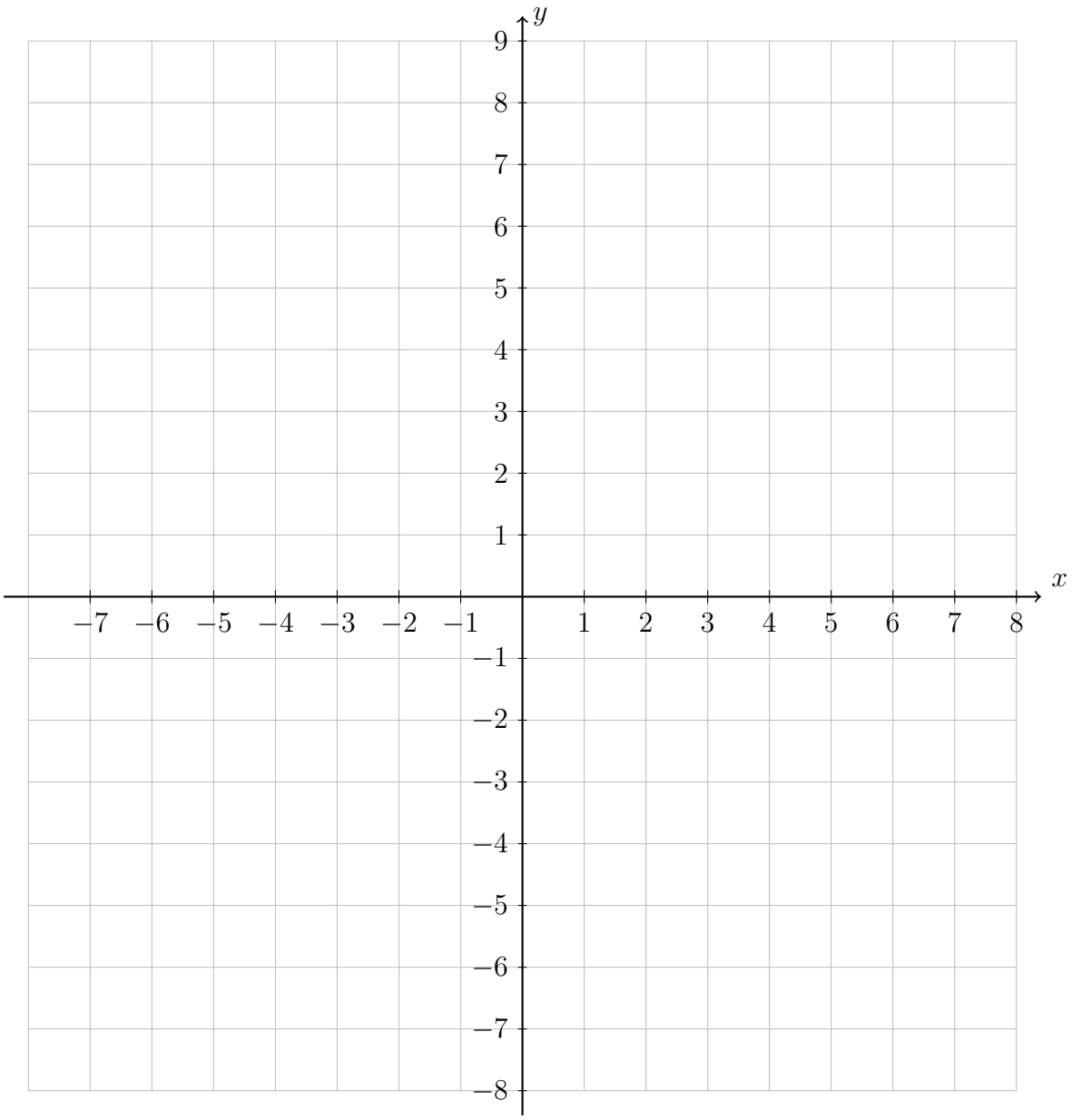
6. Given two functions, a quadratic function $f(x) = 0.6x^2 + 2.1x - 3$ and a linear function $g(x) = 1.2x + 2$.

   (a) Graph the parabola $y = f(x)$, marking the y-intercept and the vertex as an ordered pair.

   (b) Find the coordinates of the two intercepts with the x-axis, the roots or zeros of $f(x)$.

   (c) Plot the linear function, $y = g(x)$. Mark and label the two intersections of the two functions $f(x) = g(x)$ as ordered pairs. Round to the nearest hundredth.



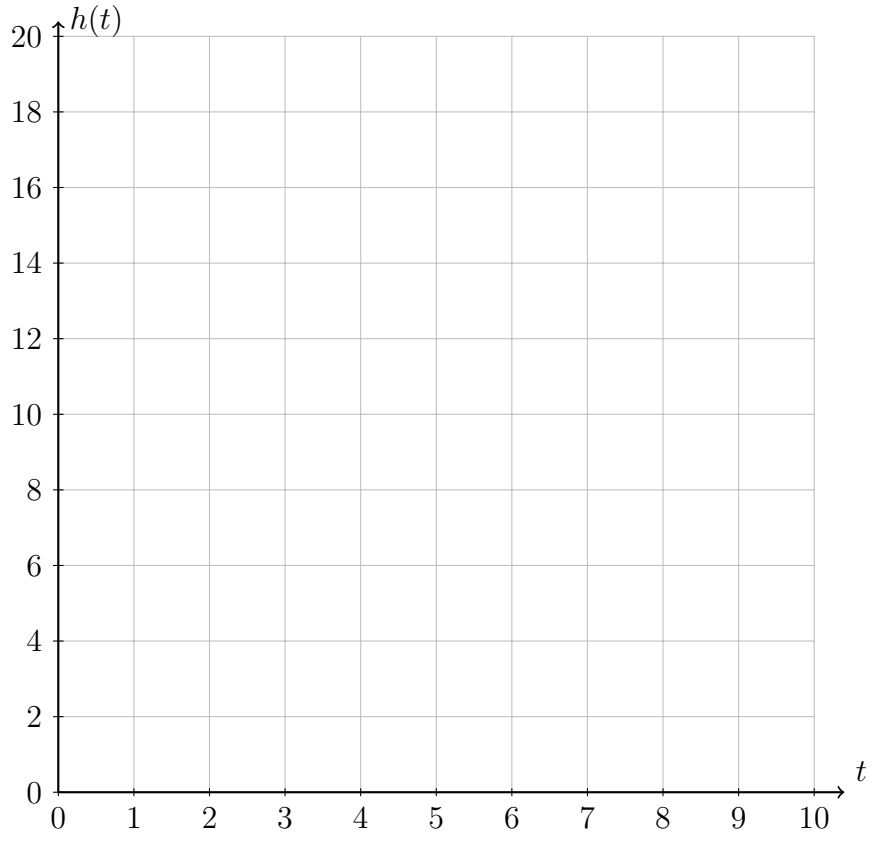
7. A dart is shot vertically upwards.

   The path of the dart can be modelled by the equation $h(t) = 6t - t^2$ where $h(t)$ is the height in meters of the dart 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.



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8. Given the arithmetic sequence $4, 8, 12, 16, 20, \ldots$

   (a) Find the common difference d.

   (b) Write down the next term, u_6.

   (c) Find the twelfth term.

   (d) Find the sum of the first twelve terms.

9. The second term of an arithmetic sequence is 40 and the sixth term is 25.

   (a) Find the common difference d.

   (b) Find the first term, u_1.

   (c) Find the sum of the first six terms.

10. Given $f(x) = \frac{4}{3}x - 8$.

    (a) Find $f(3)$.

    (b) Find $f^{-1}(0)$.

Formula Sheet

Arithmetic sequences

Terms: $u_n = u_1 + d(n-1)$

Sum: $S_n = \frac{n}{2}(u_1 + u_n)$

Equations of a straight line

Slope-intercept form: $f(x) = mx + c$

Standard form: $ax + by + d = 0$

Point-slope form: $(y - y_1) = m(x - x_1)$

Gradient: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Equations of quadratic functions

Standard form: $f(x) = ax^2 + bx + c$, with y-intercept c, axis of symmetry $x = -\frac{b}{2a}$

Solutions to $f(x) = 0$ (quadratic formula):

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Factored form: $g(x) = a(x - p)(x - q)$

has x-intercepts p, q and axis of symmetry $x = \frac{p + q}{2}$

Vertex form: $h(x) = a(x - h)^2 + k$, with vertex (h, k)