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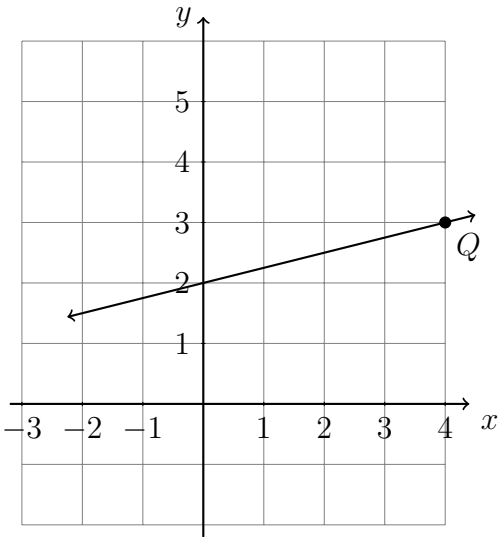
3.7 Pre-Quiz: Linear and quadratic functions

1. A linear function f is graphed below. [4]



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

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

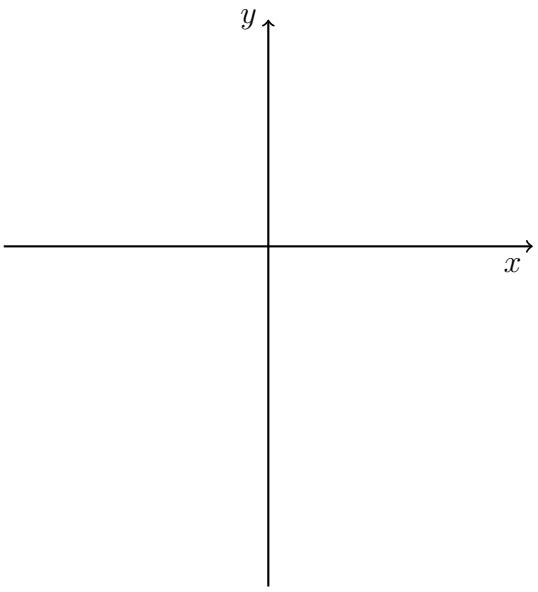
   (c) Write down the equation of the line.

   (d) State the coordinates of the point Q.

2. Write the linear equation $y - 5 = 3(x + 1)$ in the form $y = mx + c$. [2]

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

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

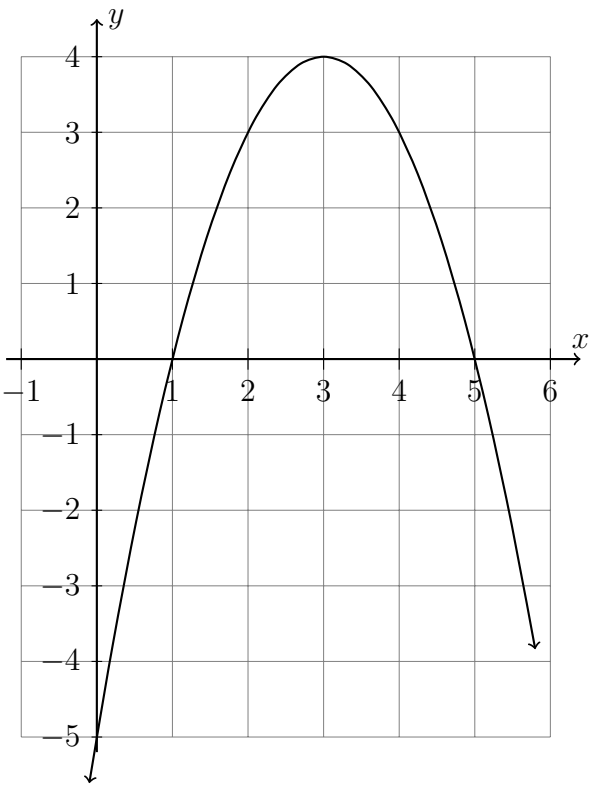
4. The function $f(x) = -x^2 + 6x - 5$ is shown on the graph.

   (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 $f(x) = a(x - p)(x - q)$



5. 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, $f(x) = (x - a)(x - b)$.

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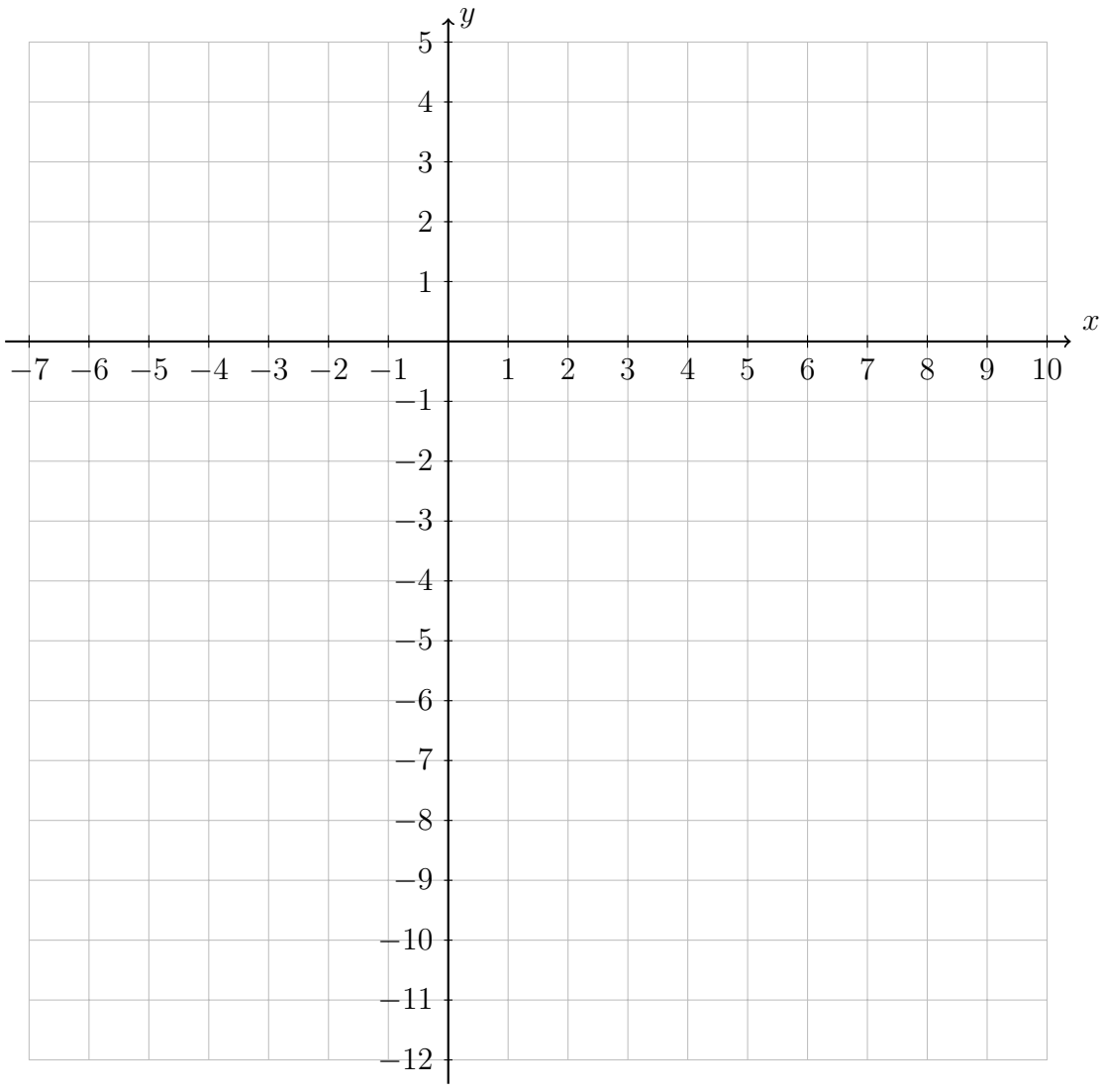
6. Given two functions, a quadratic function $f(x) = 0.6x^2 - 2.4x - 8$ and a linear function $g(x) = 0.6x - 4.4$.

   (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.



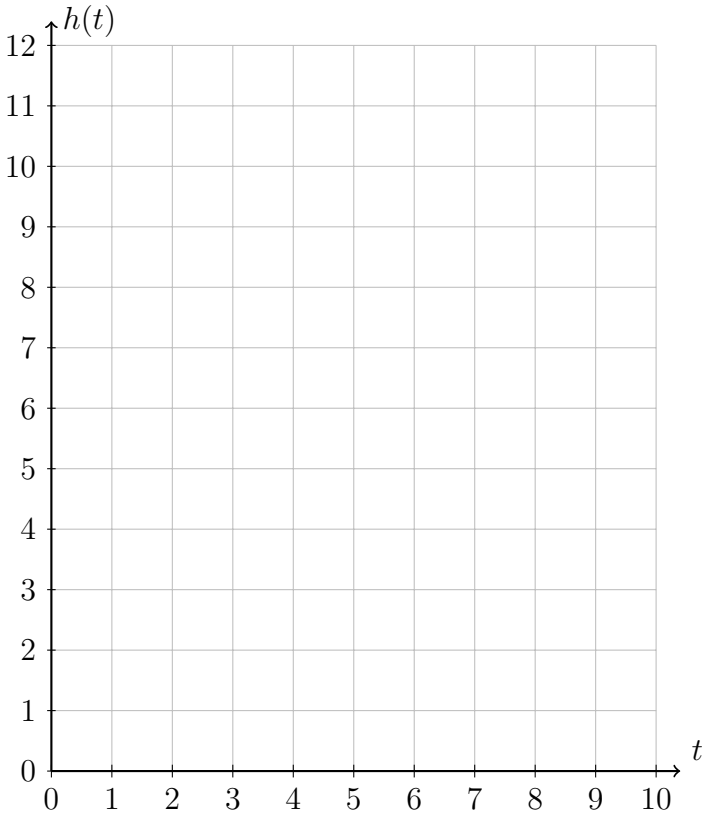
7. A ball is thrown vertically upwards.

   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.



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8. Given the arithmetic sequence $3, 7, 11, 15, 19, \ldots$ [6]

   (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 19 and the sixth term is 7. [6]

   (a) Find the common difference d.

   (b) Find the first term, u_1.

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

10. Given $f(x) = \frac{3}{5}x - 3$. [3]

    (a) Find $f(10)$.

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

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Equations of a straight line: $f(x) = mx + c$, $ax + by + d = 0$, $(y - y_1) = m(x - x_1)$

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

Arithmetic sequences

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

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

Useful forms of equations for quadratics:

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

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

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