BECA / IB Math 03-Quadratic functions Name:
12 January 2022

3.7 Exit Note Quiz: Applications of quadratic functions

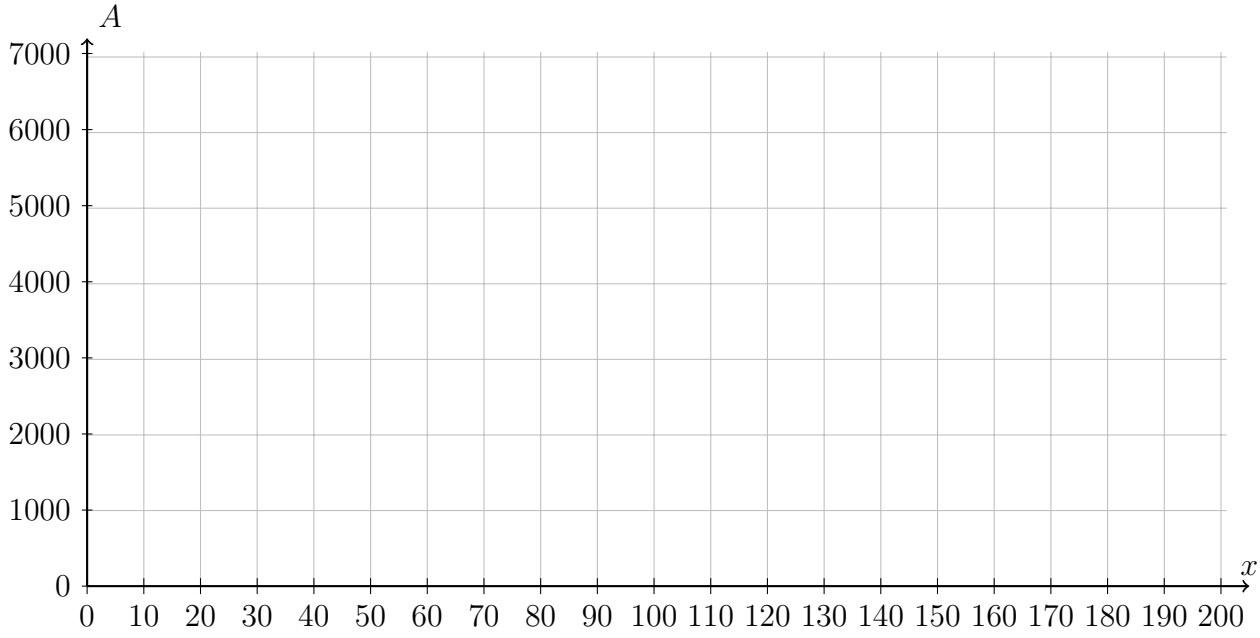
1. A rectangular picture frame has a perimeter of 320 centimeters.

   (a) Let x be the width of the frame in cm. Find an expression in terms of x for the height of the frame.

   (b) Find an expression for the area of the frame, $A\,\text{cm}^2$, in terms of x.

   (c) Plot a graph of how the area varies with width. Mark the coordinates of the vertex and x-axis intercepts.

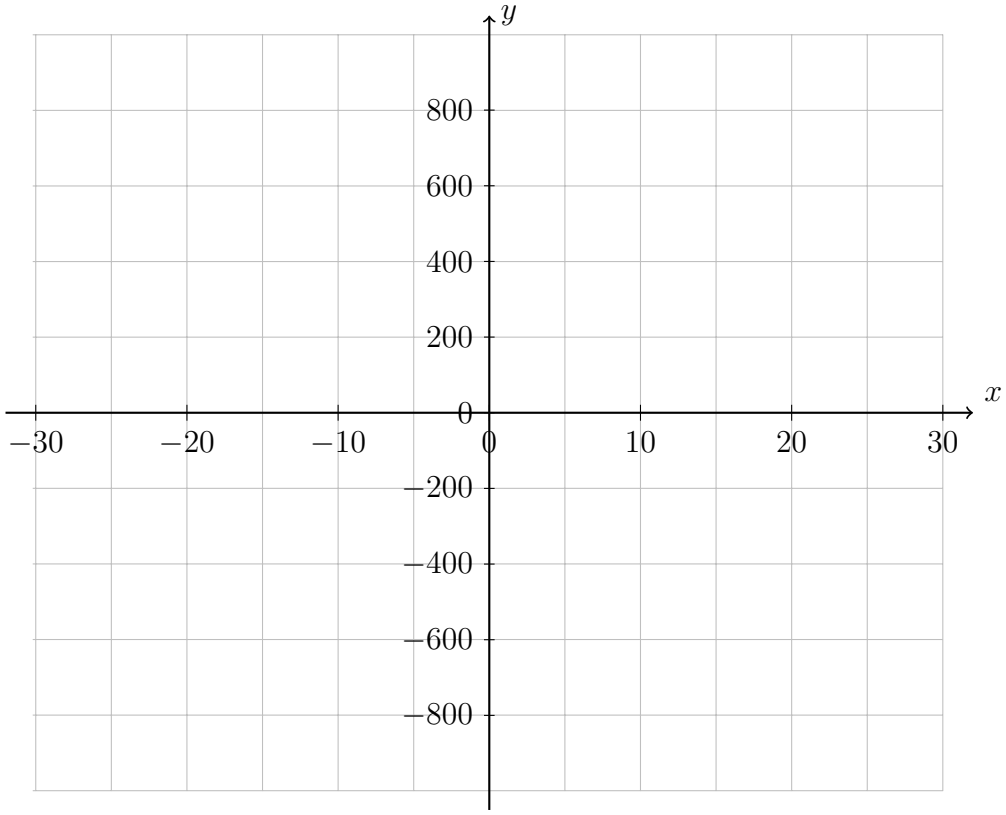
   (d) Explain what the coordinates of the vertex represent in the context of the situation.



Sum of an arithmetic series: $S_n = \frac{n}{2}(2u_1 + d(n-1))$

2. Refer to problem #2, page 429.

   The first four terms of an arithmetic sequence are 6, 10, 14, 18. Find the common difference, d. Complete the textbook problem. Use the grid below.



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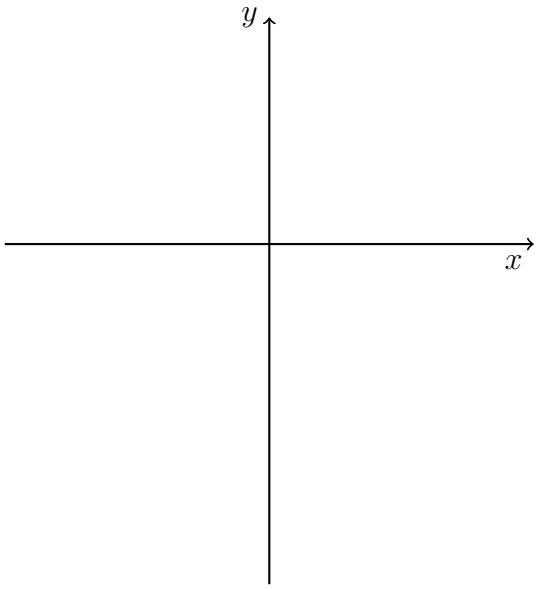
3. Given $f(x) = (x-3)(x+4)$

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

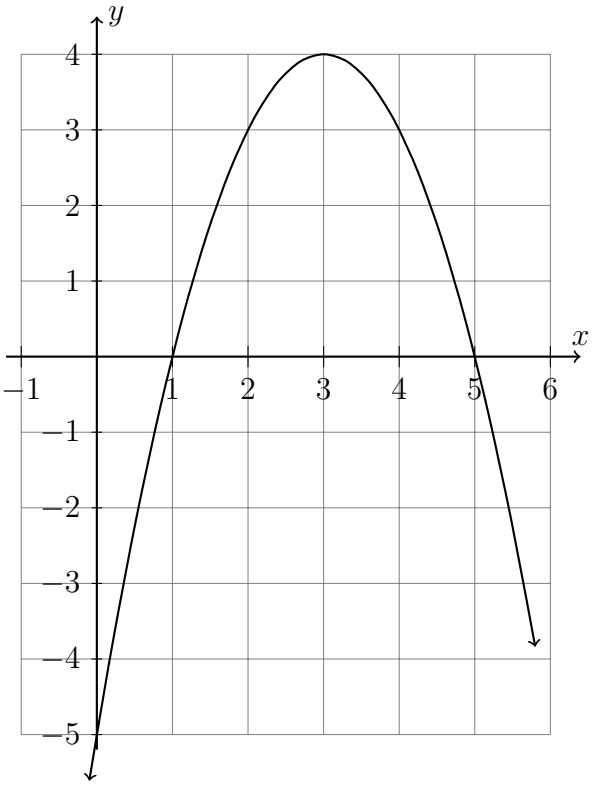
4. The function $f(x) = -x^2 + 6x - 5$ is shown on the graph.

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

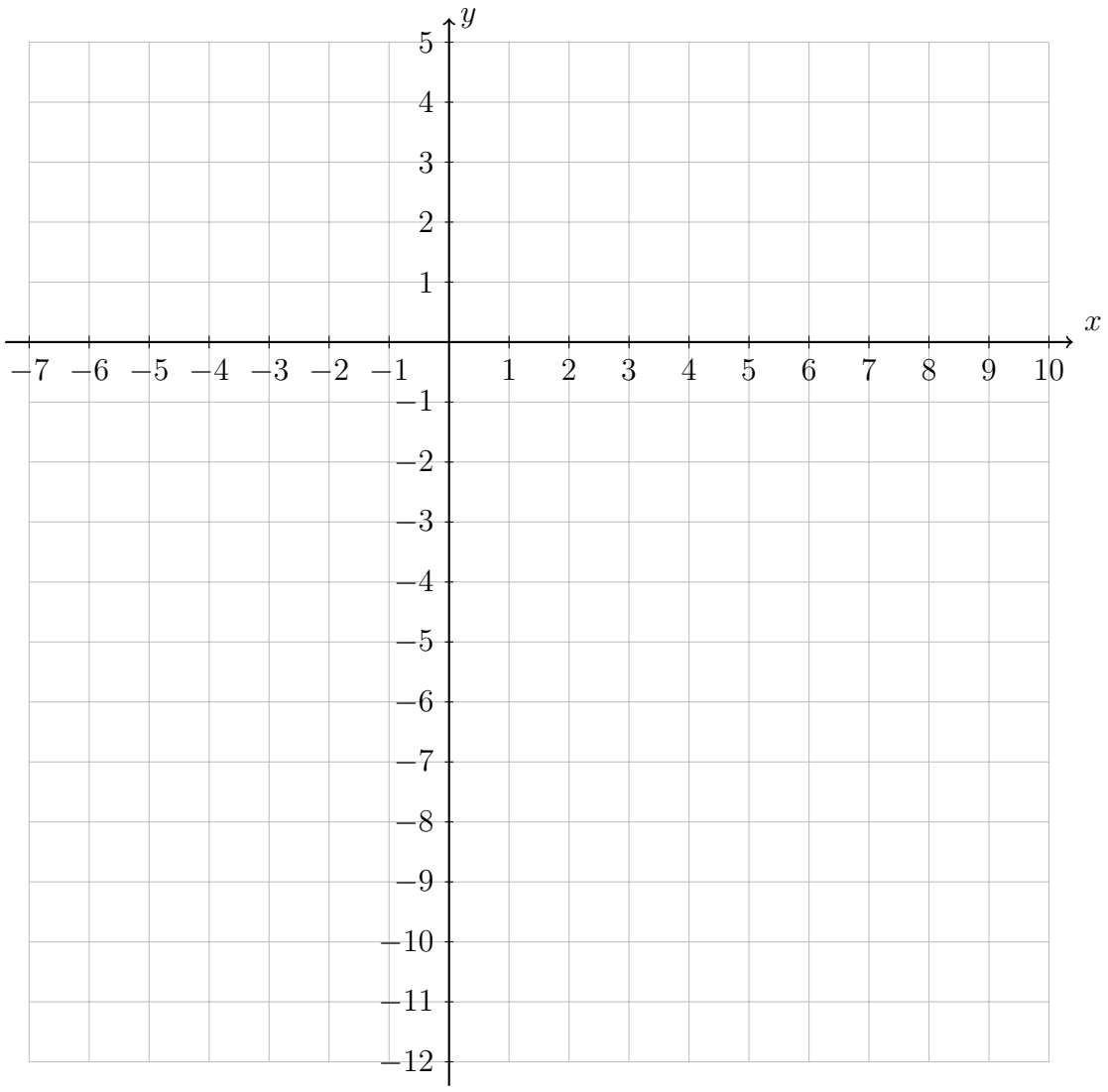


5. Given two functions, a quadratic function $f(x) = 0.6x^2 - 2.4x - 8$ and a linear function $g(x) = 0.6x - 4.4$.

   (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.



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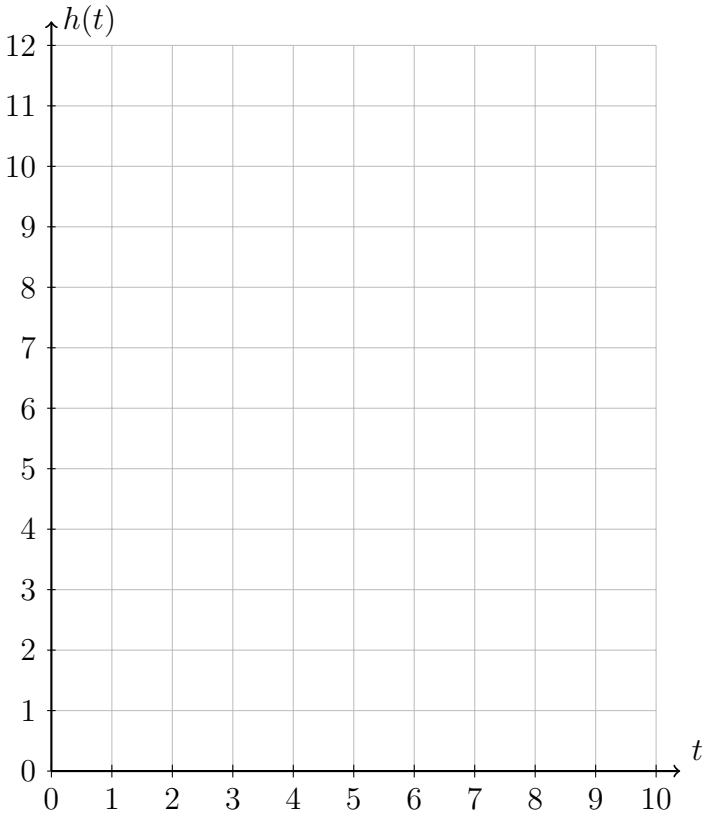
6. A ball is thrown vertically upwards.

   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.



7. The path of a football can be modeled by the quadratic equation

   $h(x) = -0.0125x^2 + 0.65x - 3.45$

   where $h(x)$ is the height of the ball in meters, and x is the horizontal distance of the football in meters.

   (a) Sketch the graph below, labeling the coordinates of the vertex and axes intercepts.

   (b) Explain what the vertex represents in context. How high was the ball kicked?

   (c) Find the x-intercepts and explain what these values represent. How far was the ball kicked?