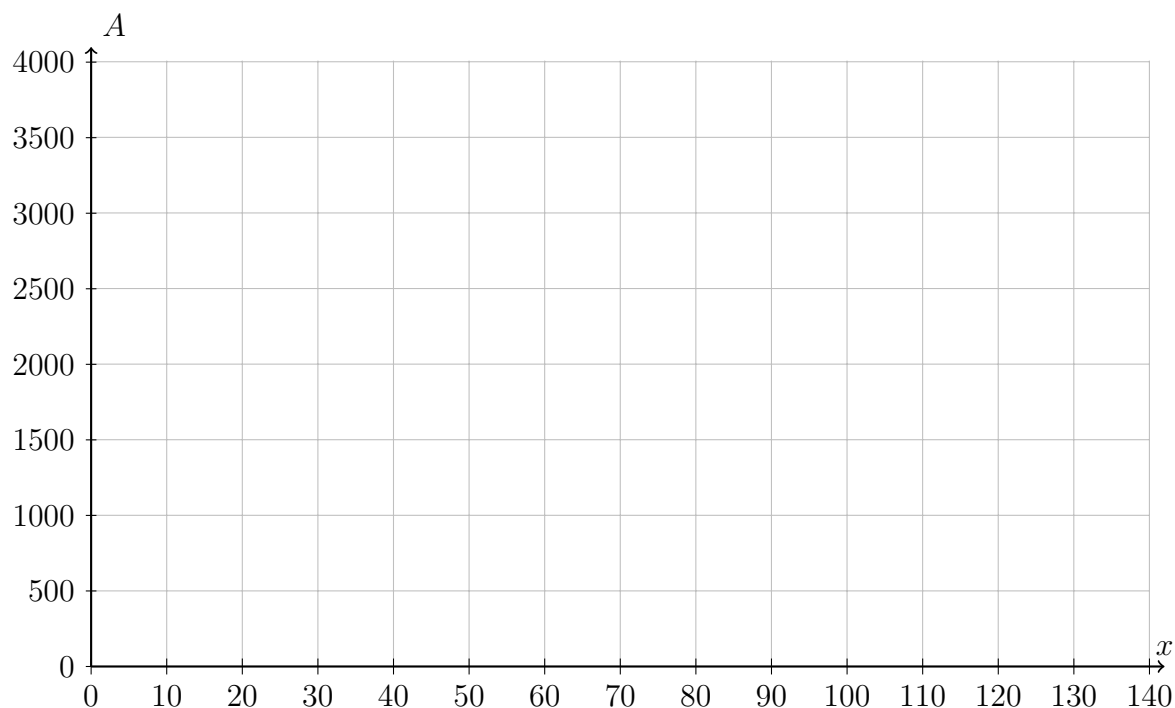


### 3.6 Applications of quadratic functions

1. Study example 4, page 428

A small rectangular window has a perimeter of 220 centimeters.

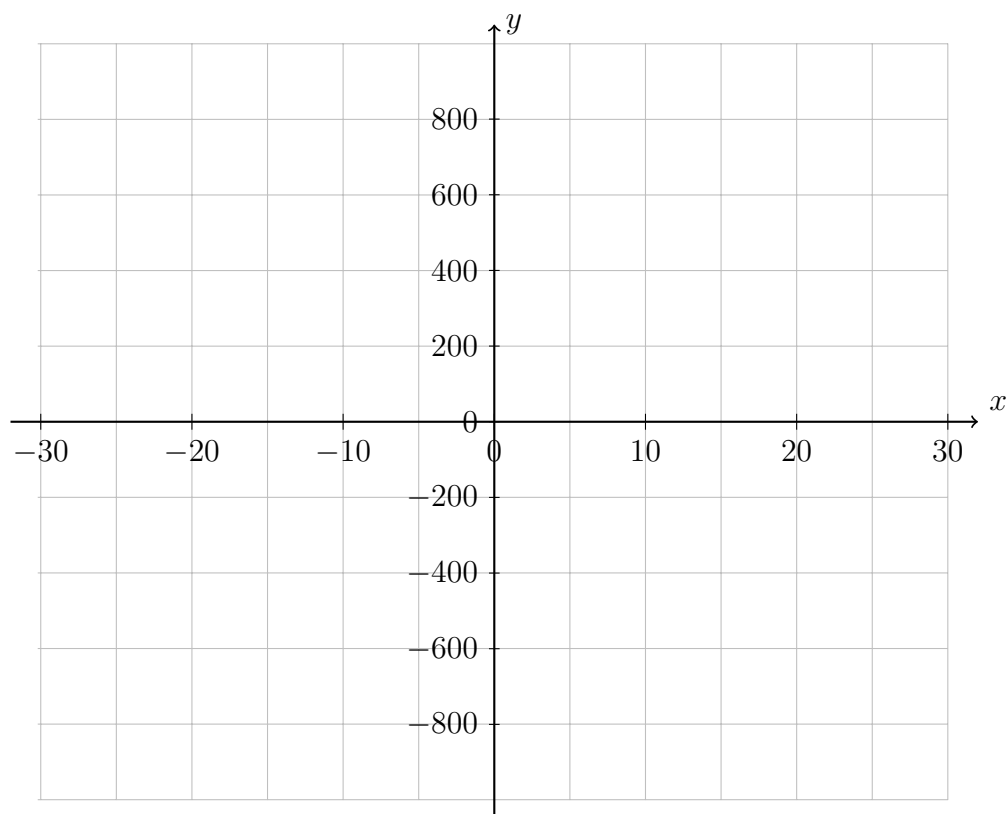
- (a) Let  $x$  be the width of the window in cm. Find an expression in terms of  $x$  for the height of the window.
- (b) Find an expression for the area of the window,  $A \text{ cm}^2$ , in terms of  $x$ .
- (c) Plot a graph of how the area varies with width. Mark the coordinates of the vertex and  $x$ -axis intercepts.
- (d) Explain what the coordinates of the vertex represent in the context of the situation.



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

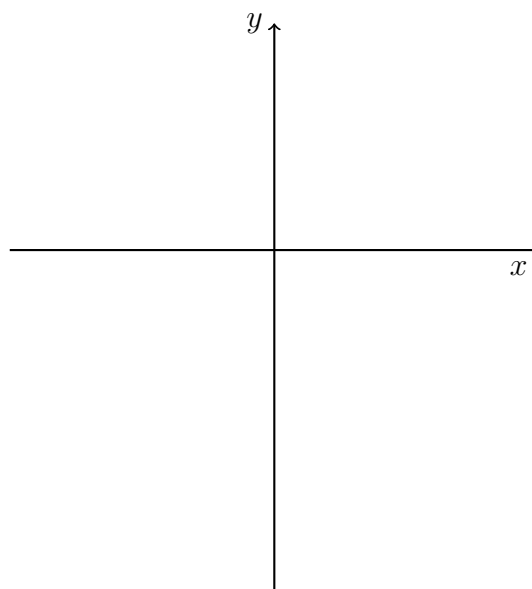
2. Refer to problem #2, page 429.

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.



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

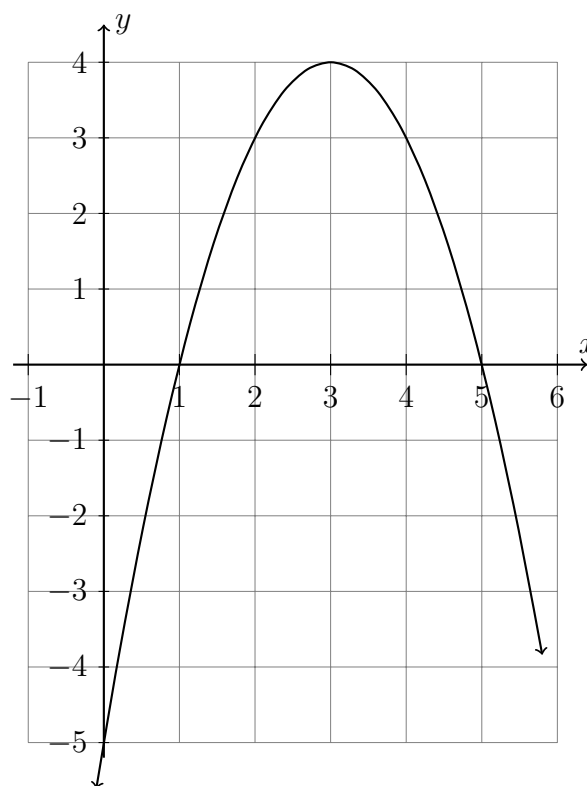
4. The function  $f(x) = -x^2 + 6x - 5$  is shown on the graph.

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

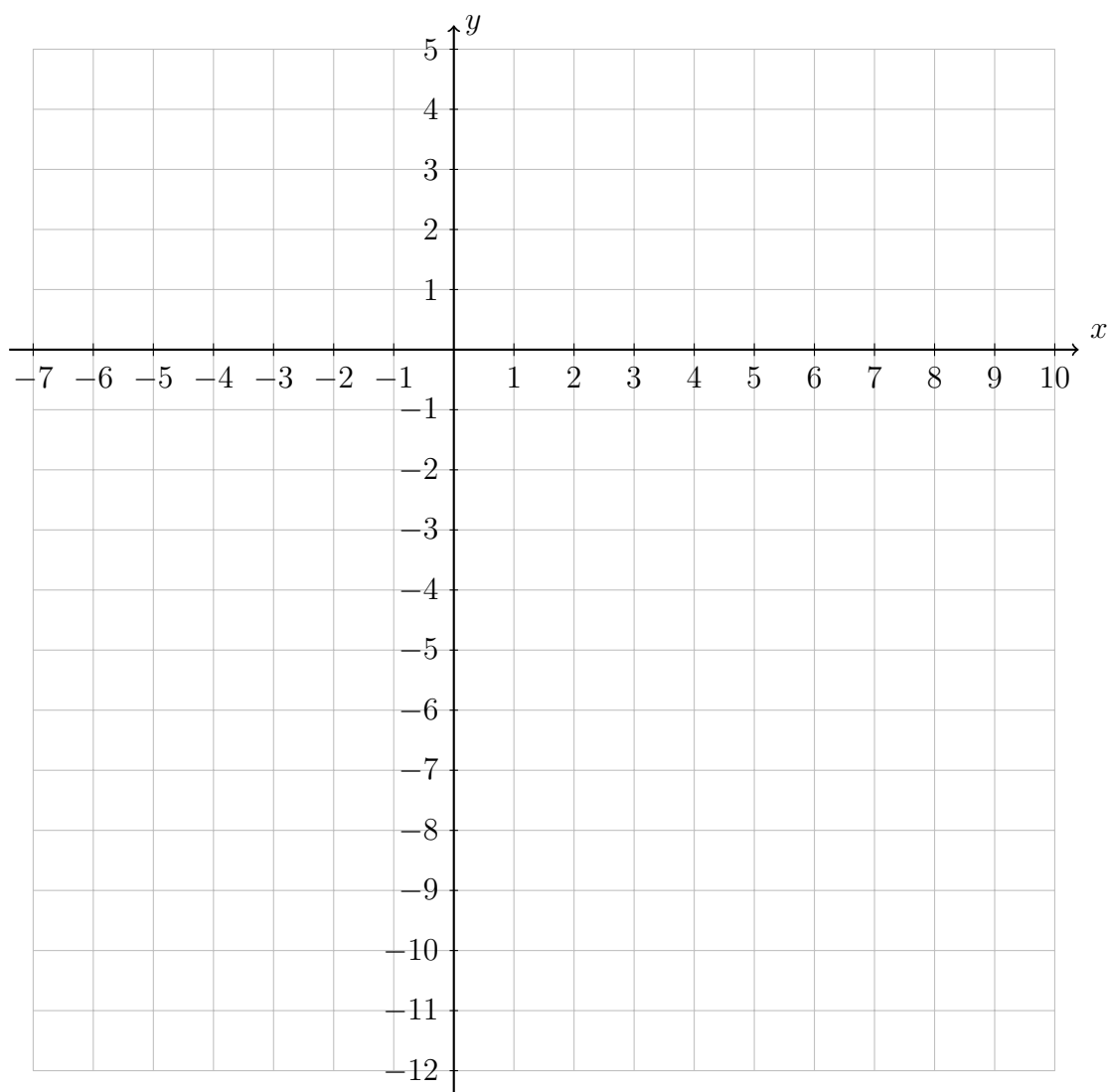


5. Given two functions, a quadratic function  $f(x) = 0.6x^2 - 2.4x - 8$  and a linear function  $g(x) = 0.6x - 4.4$ .

(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  $f(x)$ .

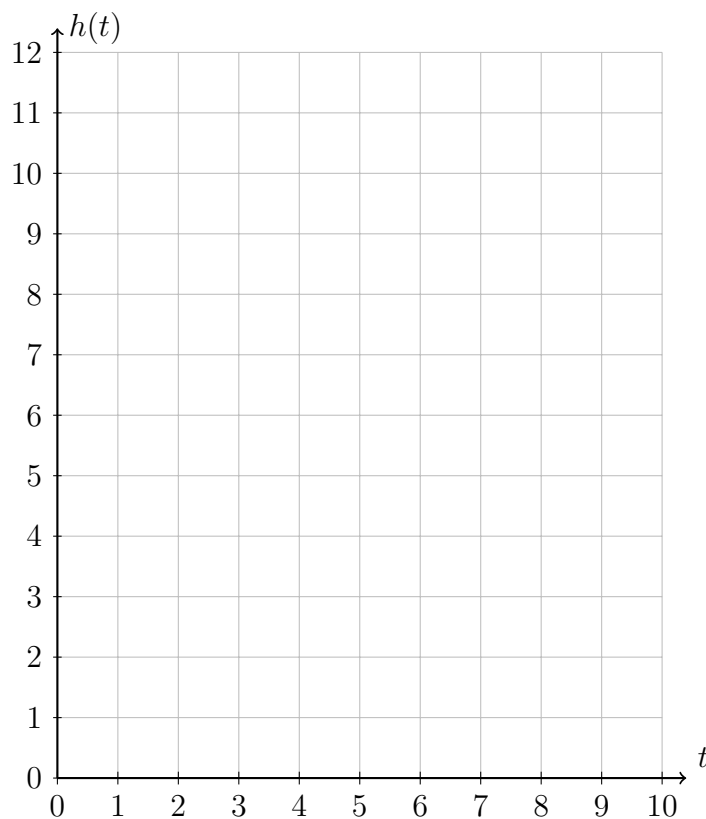
(c) Plot the linear function,  $y = g(x)$ . Mark and label the two intersections of the two functions  $f(x) = g(x)$  as ordered pairs.



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?

