

## Section 1.6 Sketch Graphs Using Transformations

- For each parabola, write:
  - the coordinates of the vertex
  - the equation of the axis of symmetry
  - the direction of opening
  - the range of the function
  - $f(x) = -4x^2 + 30$
  - $f(x) = -7(x - 4)^2$
  - $f(x) = 7(x - 4)^2 - 18$
  - $f(x) = -2(x + 3)^2 + 32$
- Describe the graph of each function in terms of transformations on the graph of  $y = x^2$ . Then, sketch the graph. Clearly label the vertex, the axis of symmetry, and one other point.
  - $y = 3(x - 3)^2$
  - $f(x) = -x^2 + 3$
  - $g(x) = 2(x - 2)^2 - 4$
  - $h(x) = -4(x + 1)^2 - 1$
- The graph of  $f(x) = x^2$  has been stretched vertically by a factor of 5 and translated 2 units to the right and 4 units down.
  - Write the equation of the graph of resulting from the transformations.
  - Sketch the graph of  $f(x) = x^2$  and its image after the transformations.
- The graph of  $f(x) = x^2$  has been stretched vertically by a factor of 3 and translated 3 units to the left and 4 units down.
  - Write the equation of the graph of resulting from the transformations.
  - Sketch the graph of  $f(x) = x^2$  and its image after the transformations.
- Write an equation of a parabola that satisfies each set of conditions.
  - vertex  $(4, -2)$   
congruent in shape to the graph of  $y = 2x^2$   
range:  $\{y \in \mathbf{R} \mid y \leq -2\}$
  - vertex  $(-1, 0)$   
 $y$ -intercept: 2
- Describe how the graphs of the three functions are related.
    - $f(x) = (x - 2)^2 - 2$
    - $g(x) = 3(x - 2)^2 - 2$
    - $h(x) = -(x - 2)^2 - 2$
  - Sketch the three graphs to verify your answer in part a).
- Write the coordinates of two points other than the vertex on the graph of  $f(x) = 3x^2$ .
  - Explain how these points can help you to draw the graph of  $g(x) = 3(x - 6)^2 - 10$ .
  - Graph the function  $g(x) = 3(x - 6)^2 - 10$ . Label the vertex and the axis of symmetry and write the domain and range.
- The path of a ball thrown from a cliff is modelled by the quadratic function  $h(t) = -4.9(t - 1)^2 + 35$ .
  - From what height is the ball thrown?
  - What is the maximum height of the ball and when does this occur?
  - Write the range of the function.
  - Graph the function. Determine how long it takes the ball to land.
  - Write the domain of the function.