

**Opportunity to Learn – Standard Form to Vertex Form**

1. Rewrite each relation in the form  $y = a(x - h)^2 + k$  by completing the square.

As you go, check that your work is correct using Desmos, by graphing both the original relation and the relation in  $y = a(x - h)^2 + k$  form.

a.  $y = x^2 + 6x - 1$

b.  $y = x^2 + 10x + 20$

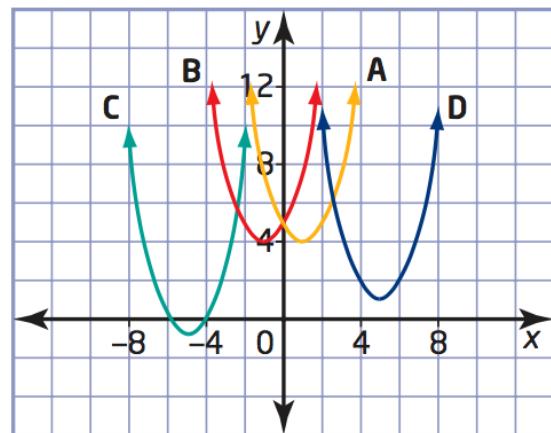
c.  $y = x^2 - 6x - 4$

d.  $y = x^2 - 8x - 2$

e.  $y = x^2 - 12x + 8$

2. Match each graph with the appropriate equation by filling the blank (A, B, C, or D).

Provide point-form explanations for how you determined what equation matches each graph.



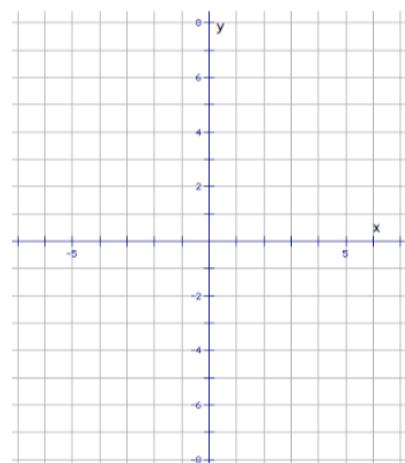
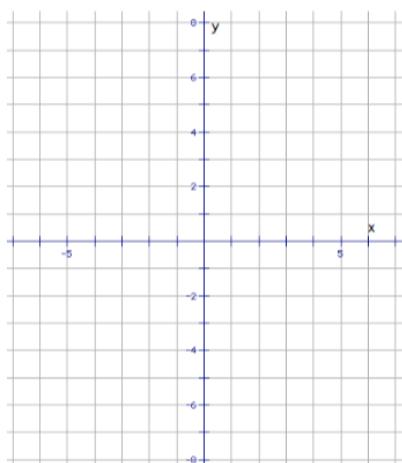
$y = (x - 5)^2 + 1$      $y = (x - 1)^2 + 4$      $y = (x + 1)^2 + 4$      $y = (x + 5)^2 - 1$

3. Find the vertex of each parabola.

Sketch the graph, labelling the vertex, the axis of symmetry, and two other points on the curve.

a.  $y = x^2 + 2x - 1$

b.  $y = x^2 - 16x + 60$



4. The path of a ball is modeled by the equation  $y = -x^2 + 4x + 1$ , where  $x$  is the horizontal distance travelled, in metres, and  $y$  is the height of the ball above the ground, in metres.

What is the maximum height of the ball, and at what horizontal distance does it occur?

HINT: Consider the vertex...

5. A diver dives from a 3-m board at a swimming pool.

Her height,  $h$ , in metres above the surface of the pool, is related to her horizontal distance from the diving board,  $d$ , in metres, by the relation

$$h = -d^2 + 2d + 3.$$

What is the diver's maximum height?

