

**DIRECTIONS:** Write the following in vertex form. Find the vertex; axis of symmetry; state whether it opens up or down; and whether it is wider, narrower, or the same shape as  $y = x^2$ . Also graph these functions (there are graphs on the back of this paper).

1.  $y = x^2 - 6x + 11$

2.  $y = -3x^2 + 12x - 9$

3.  $y = \frac{1}{2}x^2 - 2x + 3$

4.  $y = 2(x - 1)^2 - 2$

5.  $y = -(x + 4)^2 + 3$

6.  $y + 2 = \frac{1}{2}(x + 3)^2$

**DIRECTIONS:** Find the zeros (x-intercepts) of the following functions. If there are none, indicate that.

7.  $y = x^2 - 6x + 11$

8.  $y = -3x^2 + 12x - 9$

9.  $y - 3 = -(x + 4)^2$

