**Standard form**: $y = f(x) = ax^2 + bx + c$, $a \neq 0$

- If $a > 0$, then the parabola opens upward; if $a < 0$, then the parabola opens downward.

- The vertex of the parabola is the point $\left(\dfrac{-b}{2a}, f\left(\dfrac{-b}{2a}\right) \right)$, and the axis of symmetry is $x = \dfrac{-b}{2a}$.

- To find the y-intercept, *let* $x = 0$ and solve for *y*.

- To find the *x*-intercept, let $y = 0$ and solve for *x*. (This will result in a quadratic equation which might have 0, 1 or 2 solutions.)

Vertex form: $y = f(x) = a(x - h)^2 + k$, $a \neq 0$

- If $a > 0$, then the parabola opens upward; if $a < 0$, then the parabola opens downward.

- The vertex of the parabola is the point (h, k) and $x = h$ is the axis of symmetry.

- To find the *y*-intercept, let $x = 0$ and solve for *y*.

- To find the *x*-intercept, let $y = 0$ and solve for *x*. (This will result in a quadratic equation which might have 0, 1 or 2 solutions.)
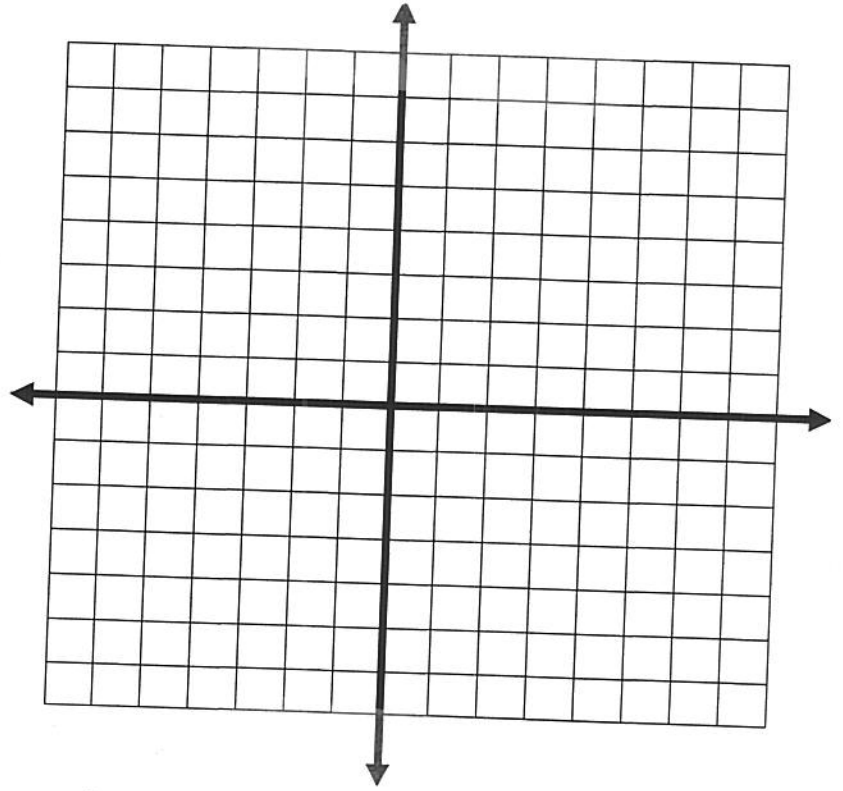
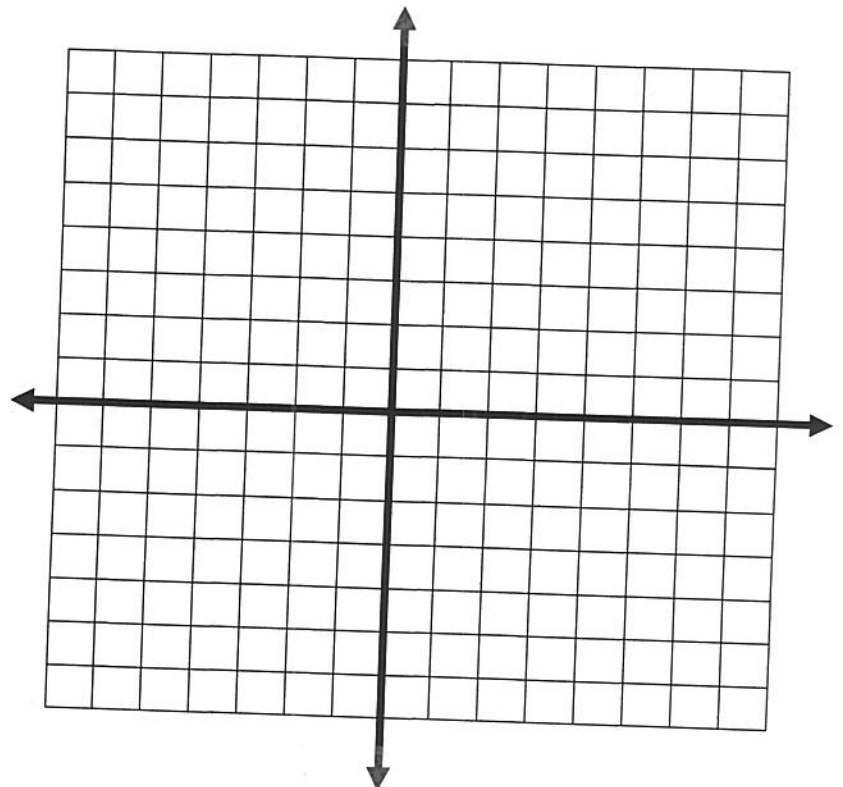**General Graph for** $y = x^2$
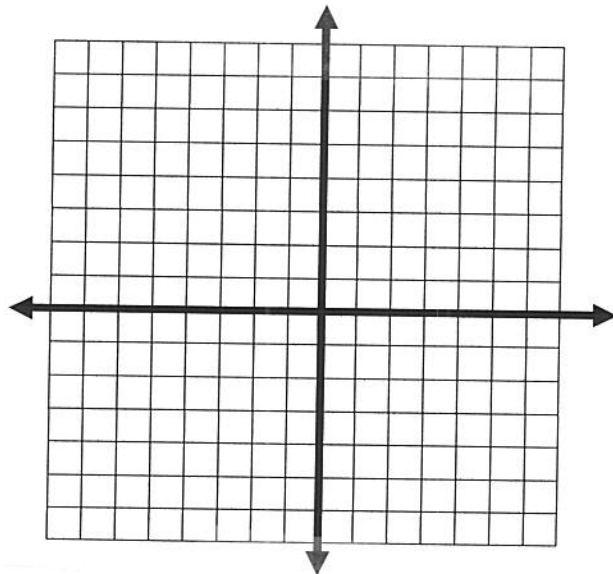
Domain:

Range:

Examples:

1. Given the quadratic function $f(x) = -x^2 + 6x - 5$, find the axis of symmetry, vertex, x- and y-intercepts and graph it.
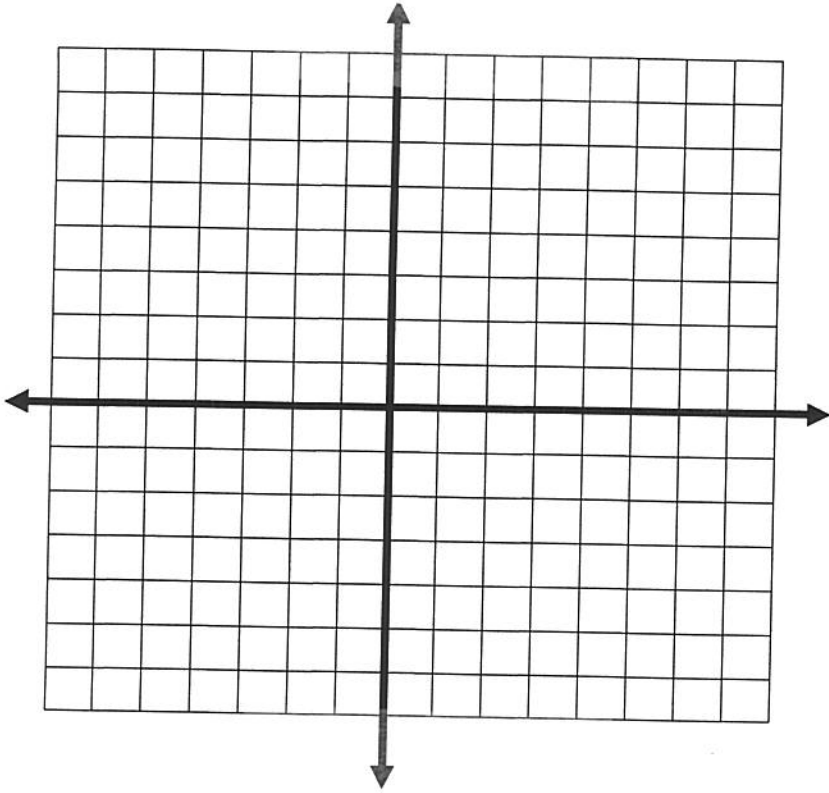
2. Given the quadratic function $f(x) = (x-4)^2$, find the axis of symmetry, vertex, x- and y-intercepts and graph it.
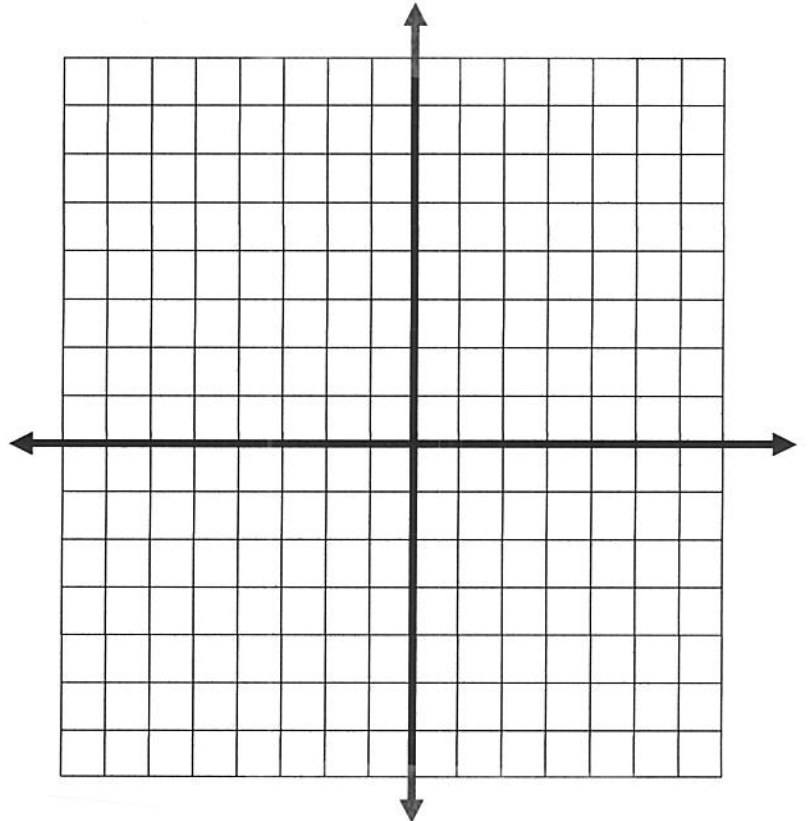
How does the graph in question 2 compare to the general graph of $y = x^2$?

3. Given the quadratic function, $f(x) = 2x^2 + x - 1$ find the axis of symmetry, vertex, x- and y-intercepts and graph it.

4. Given the quadratic function $f(x) = 2(x-1)^2 + 4$, find the axis of symmetry, vertex, x- and y-intercepts and graph it.

5. Use the information to write the vertex form equation of each parabola

      (a) $y = -x^2 - 14x - 59$

      (b) $y = x^2 - 12x + 46$

      (c) $y = x^2 - 6x + 5$

      (d) $y = x^2 + 16x + 71$

      (e) $y = x^2 - 2x - 5$

      (f) $y = x^2 + 4x$

      (g) $y = 2x^2 + 36x + 170$

      (h) $y = 2x^2 + 12x - 2$

      (i) $y = 2x^2 - 12x - 23$

For each of the following, find the axis of symmetry, vertex, x- and y-intercepts and sketch the graph on a separate piece of graph paper.

6. $y = (x - 5)^2 - 4$ 8. $y = x^2 + 4x + 5$ 10. $y = 4x^2 - 8x + 3$

7. $f(x) = x^2 + 6x + 5$ 9. $f(x) = -x^2 + 8x$ 11. $y = x^2 - 6x + 13$