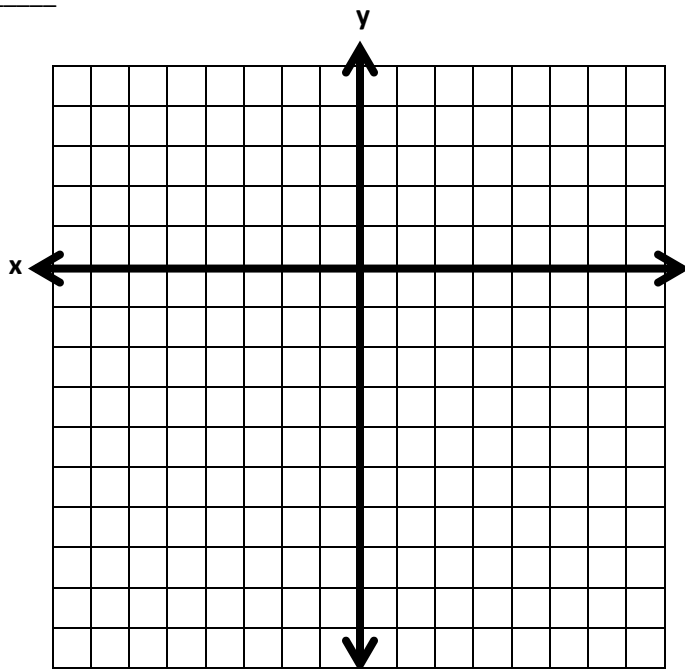


Essential Question: How do we transform a quadratic equation written in standard form to vertex form?

Do Now:

- Graph $y = -2x^2 + 8x - 6$ using a table of values.
- Determine the coordinates of the vertex. _____
- State whether the vertex is a *maximum* or a *minimum* point. _____
- State and graph the equation of the **axis of symmetry**. _____
- State the **roots** of the parabola. _____
- State the **y-intercept**. _____
- State the **domain** of the function. _____
- State the **range** of the function. _____
- State the interval for which the function is increasing. _____
- State the interval for which the function is decreasing. _____



VERTEX FORM OF A QUADRATIC FUNCTION

$$f(x) = a(x - h)^2 + k$$

where h and k are real numbers and (h, k) is the vertex

Example: Convert $y = x^2 + 12x + 32$ into vertex form, and state the vertex.

$$\begin{aligned}
 y &= x^2 + 12x + 32 \\
 y - 32 &= x^2 + 12x \\
 y - 32 + 36 &= x^2 + 12x + 36 \\
 y + 4 &= x^2 + 12x + 36 \\
 y + 4 &= (x + 6)(x + 6) \\
 y + 4 &= (x + 6)^2 \\
 \boxed{y} &= \boxed{(x + 6)^2 - 4} \quad \text{Vertex: } \boxed{(-6, -4)}
 \end{aligned}$$

- Since we will be "completing the square," isolate the x^2 and x terms and move the "c" term to the other side of the equal sign.
- Find the perfect square trinomial. Take half of the coefficient of the x term, square it, and add it to both sides of the equation.
- Simplify and factor the perfect square trinomial.
- Isolate the y term.

Rewrite the following equations in vertex form by completing the square and state the vertex.
Check your answer with the table of values on the calculator.

$$y = a(x - h)^2 + k$$

Vertex: (h, k)

1. $y = x^2 + 2x - 4$

2. $y = x^2 - 12x + 4$

Let's try some more complicated examples.



3. $y = 3x^2 + 18x - 36$

4. $f(x) = -6x^2 - 12x + 48$

A quadratic function written in standard form ($y = ax^2 + bx + c$) can be rewritten in vertex form ($y = a(x - h)^2 + k$) by _____ . When the function is written in vertex form, the vertex can easily be identified by the ordered pair (____, ____).

For each function below written in vertex form, state the vertex of the function.

1) $y = (x + 1)^2 - 7$

2) $y = \frac{1}{2}(x + 4)^2 - 2$

3) $f(x) = 3(x - 1)^2 + 6$

Rewrite each quadratic function in vertex form. State the vertex.

4) $y = x^2 + 10x - 3$

5) $g(x) = -x^2 + 6x - 14$

6) **Without using your graphing calculator**, determine which of the following could be the equation of the quadratic shown below. Explain your reasoning.

A. $y = -\frac{1}{2}(x - 2)^2 - 4$

B. $y = -\frac{1}{2}(x + 2)^2 - 4$

C. $y = \frac{1}{2}(x - 2)^2 - 4$

D. $y = \frac{1}{2}(x + 2)^2 - 4$

