Conditions

f(x)= 8x2 + 8x- 12 . How do you convert in vertex form

Solution

A quadratic function can be expressed in three formats:

- $f(x) = ax^2 + bx + c$ is called the **standard form**,
- $f(x) = a(x - x_1)(x - x_2)$ is called the **factored form**, where x_1 and x_2 are the roots of the quadratic equation, it is used in logistic map
- $f(x) = a(x - h)^2 + k$ is called the **vertex form**, where *h* and *k* are the x and y coordinates of the vertex, respectively.

To convert the **standard form** to **factored form**, one needs only the quadratic formula to determine the two roots x_1 and x_2. To convert the **standard form** to **vertex form**, one needs a process called completing the square. To convert the factored form (or vertex form) to standard form, one needs to multiply, expand and/or distribute the factors.

Let's complete the square:

For this let's find the coordinates of the vertex. The vertex of the parabola in the vertex form is

$$\left(-\frac{b}{2a}, -\frac{\Delta}{4a}\right).$$

So,

$$f(x) = a(x - \frac{8}{16})^2 - \frac{64 + 4 \cdot 8 \cdot 12}{4 \cdot 8} = a\left(x - \frac{1}{2}\right)^2 - 14$$

It's obvious, that a is 8 here:

$$8\left(x - \frac{1}{2}\right)^2 - 14 = 8\left(x^2 - x + \frac{1}{4}\right) - 14 = 8x^2 - 8x + 2 - 14 = f(x)$$

Answer: The vertex form:

$$\boldsymbol{f(x) = a\left(x - \frac{1}{2}\right)^2 - 14}$$