

Quadratic equation of one unknown

Description:

The general form of Quadratic equation of one unknown is shown as (1). You can use the formula (2) to find the two distinct roots of the equation. According to the discriminant Δ (3), the roots of equation has three different type.

1. $\Delta > 0 \rightarrow$ two distinct roots
2. $\Delta = 0 \rightarrow$ one double root
3. $\Delta < 0 \rightarrow$ no real root

Given main.cpp and x2.h, you need to implement the function in x2.cpp. The following are the function in class X_2.

1. `X_2::X_2()` $\rightarrow a = 1 \text{ 、 } b = 0 \text{ 、 } c = 0$
2. `X_2::X_2(int v1, int v2, int v3)` $\rightarrow a = v1 \text{ 、 } b = v2 \text{ 、 } c = v3$
3. `void X_2::set_equation(int v1, int v2, int v3)`
 $\rightarrow a = v1 \text{ 、 } b = v2 \text{ 、 } c = v3$
4. `void X_2::show_equation()` \rightarrow cout the following equation

$$\begin{aligned} ax^2+bx+c &= x^2+x+1 \\ ax^2+bx+c &= -x^2-x-1 \end{aligned}$$

5. `void X_2::find_real_root()` \rightarrow cout the roots of equation

```
ax^2+bx+c = x^2+x+1
No real root!!

ax^2+bx+c = x^2+2x+1
There is one double root at x = -1.000

ax^2+bx+c = x^2-9
There are two distinct roots at x = -3.000 and x = 3.000
```

6. `void X_2::find_vertex()` → cout the vertex of equation(You can see Equation(4))

```
The vertex is (0.000,0.000)
The vertex is (1.000,0.000)
The vertex is (-2.318,-173.227)
```

7. `X_2 X_2::operator + (const X_2 & obj)` → implement operator + in Quadratic equation of one unknown

Compile & Execute:

Compile: `g++ main.cpp x2.cpp -I . -o Mid03`

Execute: `./Mid03 1`

`./Mid03 2`

`./Mid03 3`

`./Mid03 4`

`./Mid03 5`

OJ: `/home/share/demo_OOP112_2 Mid 03`

Equations:

(1) General form : $y = ax^2 + bx + c$ ($a \neq 0$ & $a, b, c \in \mathbb{Z}$)

(2) Quadratic Formula : $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

(3) Discriminant Δ : $b^2 - 4ac$

(4) Vertex $(x, y) = \left(\frac{-b}{2a}, \frac{4ac - b^2}{4a}\right)$

Hint:

1. You can use **sqrt()** to calculate discriminant.
2. The roots is a **float** type. You should round roots to three decimal places. (<< fixed << setprecision(3) << root)
3. You need to **#include "x2.h"** in your x2.cpp.
4. In **find_real_root()** function, you need to cout root1 first and then cout root2 when there are two distinct roots.

$$\text{Root1} = \frac{-b - \sqrt{b^2 - 4ac}}{2a} \quad \text{Root2} = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$