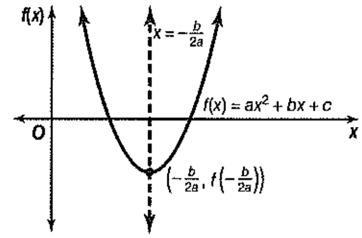
NAME ______________________ DATE ______________________ PERIOD ________

LT 3.1 Enrichment

Finding the x-intercepts of a Parabola

Quadratic formula
When $f(x) = y = 0$
Solve for x

As you know, if $f(x) = ax^2 + bx + c$ is a quadratic function, the values of x that make $f(x)$ equal to zero are $\boxed{\frac{-b+\sqrt{b^2-4ac}}{2a} \text{ and } \frac{-b-\sqrt{b^2-4ac}}{2a}}$. The average of these two number values is $-\frac{b}{2a}$. The function $f(x)$ has its maximum or minimum value when $x = -\frac{b}{2a}$. The x-intercepts of the parabola, when they exist, are $\frac{\sqrt{b^2-4ac}}{2a}$ units to the left and right of the axis of symmetry.



Example: Find the vertex, axis of symmetry, and x-intercepts for $f(x) = 5x^2 + 10x - 7$.

1. Use $x = -\frac{b}{2a}$.

$\boxed{x = -\frac{10}{2(5)} = -1}$ The x-coordinate of the vertex is -1.

Substitute $x = -1$ in $f(x) = 5x^2 + 10x - 7$.

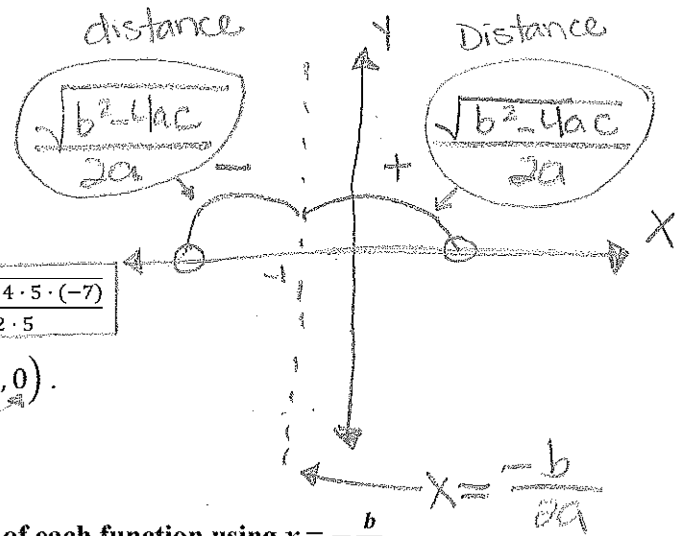
2. $f(-1) = 5(-1)^2 + 10(-1) - 7 \boxed{= -12. \text{ The vertex is } (-1, -12).}$

The axis of symmetry is $x = -\frac{b}{2a}$, or $x = -1$.

The x-coordinates of the x-intercepts are $-1 \pm \boxed{\frac{\sqrt{b^2-4ac}}{2a}} = -1 \pm \boxed{\frac{\sqrt{10^2 - 4\cdot 5\cdot(-7)}}{2\cdot 5}}$

$= -1 \pm \frac{\sqrt{240}}{10}$. The x-intercepts are $\left(-1 - \frac{2}{5}\sqrt{15}, 0\right)$ and $\left(-1 + \frac{2}{5}\sqrt{15}, 0\right)$.

$\sqrt{240} = \sqrt{24\cdot 10}$ $y = 0$



Exercises $= \sqrt{(2\cdot 2)\cdot 3(2\cdot 2)5} = 2\cdot 2\sqrt{15} = 4\sqrt{15}$

Find the vertex, axis of symmetry, and x-intercepts for the graph of each function using $x = -\frac{b}{2a}$.

1. $f(x) = x^2 - 4x - 8$

2. $g(x) = -4x^2 - 8x + 3$

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

4. $f(x) = 2x^2 + 6x + 5$

5. $A(x) = x^2 + 12x + 36$

6. $k(x) = -2x^2 + 2x - 6$

Honors Q

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$$ ← when do we use this?

but I said use $x = \frac{-b}{2a}$

and $\pm \frac{\sqrt{b^2-4ac}}{2a}$?