Unit 1: Lesson #8

Completing the square

Discovering the discriminant



SWUT:

* An equation that contains a perfect square can be solved by finding square roots. The simplest type of this equation has the form 𝑎𝑥2 = 𝑐.
* A perfect square trinomial is in the form$ x^{2}+bx+\left(\frac{b}{2}\right)^{2}$, which factors into $(x+\frac{b}{2})^{2}$.
* Completing a perfect square trinomial allows the completed trinomial to be factored as the square of a binomial.
* The real solutions, or roots, of a quadratic equation show the zeros of the related quadratic function and the x-intercepts of its graph.
* The discriminant of the quadratic equation is $b^{2}-4ac$. The discriminant can be used to describe the solutions of a Quadratic Equation.

**Sure you can factor, but our variable, x, can be isolated in one term…so why not use opposite math?**

1. Solve $5x^{2}=80$ 2. Solve $36x^{2}-25=0$



There are TWO solutions...Don’t forget the

What do you remember about “Completing the square?”

$x^{2}-4x-5=0$ **Steps:**

1. Move the constant to the right side of the equal sign.
2. **Add** $\left(\frac{b}{2}\right)^{2}$**to both sides of the equation to complete the square.**
3. Factor the left side, write it as a binomial squared.
4. Take the square root of both sides. Remember to write ±.
5. Solve for the variable.

**More Examples:**

1. $x^{2}+6x+4=0$ 2. $x^{2}-5x+1=0$

***What happens if there is a coefficient in front of the squared term?***

**Examples:**

1. $2x^{2}+4x-10=0$ 2. $4x^{2}+4x-5=0$

**Summary**

|  |  |  |
| --- | --- | --- |
| **Value of the Discriminant** | **Type of Roots** | **Graph of a function with this discriminant** |
| $$b^{2}-4ac>0 $$$$(perfect square)$$ |  |  |
| $$b^{2}-4ac>0 $$$$\left(non-perfect square\right)$$ |  |  |
| $$b^{2}-4ac=0 $$ |  |  |
| $$b^{2}-4ac<0 $$$$ $$ |  |  |

**Practice.** For each of the following, evaluate the discriminant, and determine the type of solutions.

|  |  |  |
| --- | --- | --- |
| Quadratic | Discriminant | Nature of the Roots |
| $$3x^{2}+2x-1=0$$ |  |  |
| $$3x^{2}+x=-3$$ |  |  |
| $$x^{2}+8x=-16$$ |  |  |
| $$x^{2}-5=7x$$ |  |  |

**Challenge:**

1. For which positive value of m will the equation $4x^{2}+mx+9=0$ have roots that are real, equal, and rational?
2. Find all values of c for which the roots of the equation $4x^{2}-4x+c=0$ will be real numbers.

HOMEWORK 1-8

















***Solve by completing the square:***

Extra: