Warm-Up

Math 2 – Honors
Unit 3 – Quadratic Functions Continued
Lesson 4 → Discriminant & Quadratic Formula

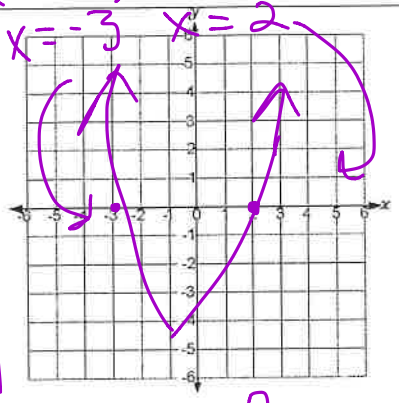
Name_____
Date_____ Pd_____

- Solve the following equations by factoring.
- Graph the equation.

1. $x^2 + x - 6 = 0$

$(x+3)(x-2)=0$

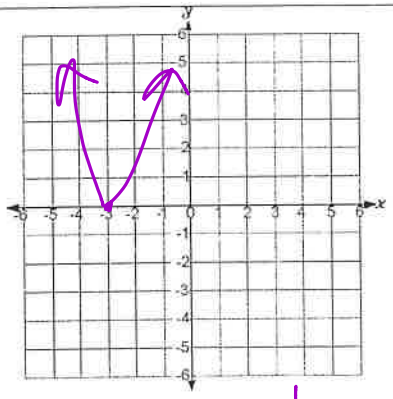
$x=-3$ $x=2$



Number of Solutions: 2

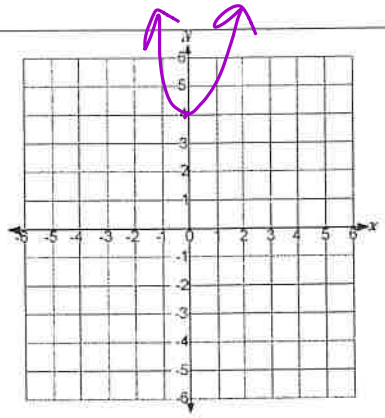
2. $x^2 + 6x + 9 = 0$

$(x+3)(x+3)$



Number of Solutions: 1

3. $x^2 + 4 = 0$



Real

Number of Solutions: 0

➢ **Quadratic Equation:** $ax^2 + bx + c = 0$

$3x^2+2x+1$
$a \quad b \quad c$

x^2+0x+4
$x^2+4=0$
$\sqrt{x^2}=\sqrt{-4}$ $x=\pm 2i$

➢ **The Discriminant:** $b^2 - 4ac$

✓ The discriminant is used to determine the **number** and **type** of solutions (roots) of a quadratic equation.

- Using the same three examples from above, find the value of the discriminant and describe the roots.

1. $1x^2 + 1x - 6 = 0$
$a \quad b \quad c$

b^2-4ac
$(1)^2-4(1)(-6)$

D = 25 # of Roots: 2

Type of Roots: Real Rational

2. $1x^2 + 6x + 9 = 0$

b^2-4ac
$(6)^2-4(1)(9)$

D = 0 # of Roots: 1

Type of Roots: 1 Real

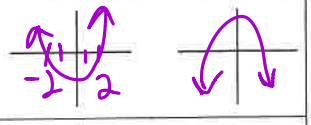
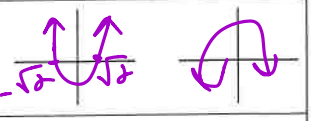
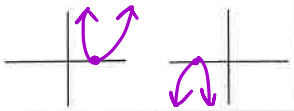
3. $x^2 + 4 = 0$

$1x^2+0x+4$
$(0)^2-4(1)(4)$

D = −16 # of Roots: 2 imaginary

Type of Roots:

➢ Discriminant Conclusions:

Value of the Discriminant: $b^2 - 4ac$	Number and Type of Roots	What does the graph look like?
$b^2 - 4ac$ is **POSITIVE** and a **PERFECT SQUARE** $b^2 - 4ac > 0$	2 real	Intersects the x – axis twice 
$b^2 - 4ac$ is **POSITIVE** and **NOT** a **PERFECT SQUARE** $b^2 - 4ac > 0$	2 irrational	Intersects the x – axis twice 
$b^2 - 4ac = 0$ →	1 Real	Intersects the x – axis once 
$b^2 - 4ac$ is **NEGATIVE** $b^2 - 4ac < 0$	2 complex or 2 imaginary	Never Intersects the x – axis 

❖ **Classwork:** Find the value of the discriminant and state the number and type of roots.

Equation	Discriminant	Number and Type of Roots	Rational or Irrational
1. $8x^2 + 2x - 1 = 0$			
2. $x^2 + x + 1 = 0$			
3. $x^2 - 27 = 0$			
4. $x^2 - 8x = -16$			
5. $x^2 + 4x + 9 = 10$			
6. $3x^2 + 5x - 12 = 0$			

➢ Solving Quadratic Equations using the Quadratic Formula

- $ax^2 + bx + c = 0$
- $\boxed{x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$
- The Quadratic Formula is used to solve any quadratic equation, especially those that will not factor.
- Examples: Solve using the Quadratic Formula → $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

1. $x^2 - 5x - 24 = 0$

$(x-8)(x+3)=0$

$x = +8, -3$

$x^2 - 5/2x + \frac{100}{16} = 24 + \frac{100}{16}$

$\sqrt{(x - \frac{10}{4})^2} = \sqrt{\frac{121}{4}}$

$x - \frac{10}{4} = \pm \frac{11}{2}$ → 8

2. $x^2 + 5x + 5 = 0$

$x^2 + 5x + \frac{25}{4} = -5 + \frac{25}{4}$

$\boxed{(\frac{5}{2})^2 = \frac{25}{4}}$

$\sqrt{(x + 5/2)^2} = \sqrt{5/4}$

$x + 5/2 = \pm\sqrt{5/4}$

$x = -5/2 \pm \sqrt{5/4}$

$a=1\ b=5\ c=5$

$\frac{-(5) \pm \sqrt{(5)^2 - 4(1)(5)}}{2(1)}$

$\frac{-5 \pm \sqrt{5}}{2} = 0$

$X = \frac{10}{4} \pm \frac{11}{2} \rightarrow -3$

3. $4x^2 + 8x - 1 = 0$

A B C

$\frac{-(8) \pm \sqrt{(8)^2 - 4(4)(-1)}}{2(4)}$

$2|80$, $2|40$, $2|20$, $2|10$, 5

$\frac{-8 \pm \sqrt{80}}{8} = \frac{-8 \pm 4\sqrt{5}}{8}$

$\frac{-2 \pm \sqrt{5}}{2}$

$-1 \pm \sqrt{5/4}$

4. $4x^2 = -11x + 20$

$+11x - 20$

$4x^2 + 11x - 20 = 0$

$\frac{-(11) \pm \sqrt{(11)^2 - 4(4)(-20)}}{2(4)}$

$\frac{-11 \pm \sqrt{441}}{8} = \frac{-11 \pm 21}{8}$

$2(x^2 + 11x - 20)$

$x^2 + 11x - 80$

$(x + \frac{16}{4})(x - \frac{5}{4})$

$(x+4)(4x-5)$

$x = -4 \quad x = 5/4$

$\frac{-11+21}{8}$ $5/4$

-4

$\frac{-11-21}{8}$

5. $x^2 + 25 = 10x$

$x^2 - 10x + 25 = 0$

$(x - 5)(x - 5) = 0$

$x = 5$

6. $x^2 + 2x + 4 = 0$

$\frac{-(2) \pm \sqrt{(2)^2 - 4(1)(4)}}{2(1)}$

$2|12$, $2|6$, 3

$\frac{-2 \pm \sqrt{-12}}{2}$ $\frac{-2 \pm 2i\sqrt{3}}{2}$

$-1 \pm i\sqrt{3}$

Math 2 – Honors
Unit 3 – Quadratic Functions Continued
Lesson 4 → Discriminant & Quadratic Formula HOMEWORK

Name_____
Date_____ Pd_____

- Solve using the Quadratic Formula → $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- Express answers in simplest radical form or complex form. NO DECIMALS!!

1. $4x^2 + 11x - 20 = 0$

$x^2+11x-80=0$

$(x+16)(x-5)=0$

$4 \quad 1$

$(x+4)(x-5/4)=0$

$x=-4 \quad x=5/4$

2. $x^2 - 5x - 24 = 0$

$(x-8)(x+3)=0$

$x=8, -3$

3. $x^2 - 3x - 3 = 0$

$\frac{3 \pm \sqrt{(-3)^2-4(1)(-3)}}{2(1)}$

$\frac{3 \pm \sqrt{21}}{2}$

4. $x^2 + 5x + 5 = 0$

$\frac{-5 \pm \sqrt{25-4(1)(5)}}{2}$

$\frac{-5 \pm \sqrt{5}}{2}$

5. $x^2 = -x + 1$

x^2+x-1

$\frac{-1 \pm \sqrt{1-4(1)(-1)}}{2(1)}$

$\frac{-1 \pm \sqrt{5}}{2}$

6. $4x^2 + 8x = 1$

$4x^2+8x-1=0$

$\frac{-8 \pm \sqrt{64-4(4)(-1)}}{8}$

$\frac{-8 \pm \sqrt{80}}{8} \quad \frac{-8 \pm 4\sqrt{5}}{8}$

$\frac{-2 \pm \sqrt{5}}{2}$