Algebra 1 Unit 5 - Quadratic Equations Notes

Solving equations via "COMPLETING THE SQUARE":

The Equation: $x^2+6x+2=0$

STEP 1: move constant term to the other side) $x^2+6x+\_\_\_\_=-2$

STEP 2: make the left hand side a perfect square trinomial by adding $\left(\frac{b}{2}\right)^2$ to **both** sides $x^2+6x+9=-2+9$

$\frac{6}{2}=3$ $3^2=9$ $x^2+6x+9=(x+3)^2$

STEP 3: factor the left side, simplify the right side $(x+3)^2=7$ (You've completed the square – time to solve!)

$\sqrt{(x+3)^2}=\pm\sqrt{7}$ $x=-3\pm\sqrt{7}$

STEP 4: solve by finding square roots $x+3=\sqrt{7}$ *and* $x+3=-\sqrt{7}$

$x=-3+\sqrt{7}$ *and* $x=-3-\sqrt{7}$

$x=3\pm7=10,-4$

Group Practice: Solve for x.

1. $x^2-6x-72=0$

$+72\ +72$

$x^2-6x+9=72+9$

$\frac{-6}{2}=-3$ $(-3)^2=9$

$\sqrt{(x-3)^2}=\sqrt{81}$

$x-3=\pm9$

$+3\ +3$

$x=3+9\rightarrow12$ $\rightarrow-6$

$x=-6,\ x=12$

2. $x^2+80=18x$

$-80\ -80$

$x^2=18x-80$

$-18x\ -18x$

$x^2-18x+81=-80+81$

$\frac{b}{2}=\frac{-18}{2}=-9$ $(-9)^2=81$

$\sqrt{(x-9)^2}=\sqrt{1}$

$x-9=\pm1$

$+9\ +9$

$x=$ _____

3. $x^2-14x-59=-20$

$+59\ +59$

$x^2-14x+49=39+49$

$\frac{-14}{2}=-7$ $(-7)^2=49$

$\sqrt{(x-7)^2}=\sqrt{88}$

$x-7=\pm\sqrt{88}$

$x-7=\pm2\sqrt{22}$

$+7\ +7$

$x=7\pm2\sqrt{22}$

$x=7+2\sqrt{22}$ $x=7-2\sqrt{22}$

88 → 8, 11 → 2, 4 → 2, 2

4. $2x^2-36x+10=0$

$-10\ -10$

$2x^2-36x+\square=-10+\square$

$2(x^2-18+\square)=-5+\square$

$x=$ _____

Algebra 1 Unit 5 - Quadratic Equations Notes

5. $x^2 + 6x - 21 = -6$

$+21 \quad +21$

$x^2 + 6x + \boxed{9} = 15 + \boxed{9}$

$\frac{6}{2} = 3 \quad 3^2 = 9$

$\sqrt{(x+3)^2} = \sqrt{24}$

$x + 3 = \pm\sqrt{24}$

$x + 3 = \pm 2\sqrt{6}$

$-3 \quad -3$

$x = -3 \pm 2\sqrt{6}$

X = _____

6. $x^2 + 12x = -18$

X = _____

Algebra 1 Unit 5 - Quadratic Equations Notes

Day 6 - Solving by Quadratic Formula

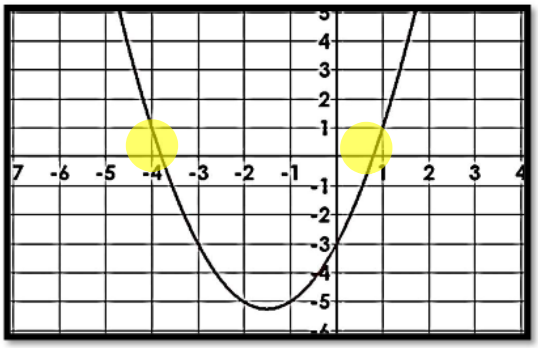
Quadratic Conundrum

Consider the quadratic equation $x^2+3x-3=0$.

a. If possible, factor the quadratic equation.

$x \cdot x$ $3 \cdot 1$

NOT possible!



The Quadratic Formula

We have learned three methods for solving quadratics: factoring, taking the square root, and completing the square. Factoring quadratics only works when the equations are factorable. Taking the square root only works when the equations are not in standard form. Completing the square only works when a is 1 and b is even.

What method do you use when your equations are not factorable, but are in standard form, and a may not be 1 and b may not be even?

The Quadratic Formula

for equations in standard form: $y = ax^2 + bx + c$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

discriminant

x represents the zeros and b^2-4ac is the discriminant

\+ discrim. = 2 solutions

\- discrim = No solution

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Practice with the Quadratic Formula

For the quadratic equations below, use the quadratic formula to find the solutions. Write your answer in simplest radical form.

1) $4x^2-13x+3=0$ a = 4 b = -13 c = 3

$b^2-4ac = (-13)^2-4(4)(3)$

$169-48=121$

$x=\frac{-b\pm\sqrt{\quad}}{2a}$

$x=\frac{13\pm\sqrt{121}}{2(4)}=\frac{13\pm11}{8}$

$\frac{13+11}{8}=\frac{24}{8}=3$

$\frac{13-11}{8}=\frac{2}{8}=\frac{1}{4}$

Discriminant: 121

Solutions: $x=3, x=1/4$

~~Approx: _____~~

2) $9x^2+6x+1=0$ a = ___ b = ___ c = ___

Discriminant: _____

Zeros: _____

~~Approx: _____~~

3) $7x^2+8x+3=0$ a = 7 b = 8 c = 3

$b^2-4ac = 8^2-4(7)(3)$

$64-84=-20$

NO SOLUTION

Discriminant: -20

x = none

Approx: _____

4) $-3x^2+2x=-8$ a = ___ b = ___ c = ___

Discriminant: _____

Roots: _____

Approx: _____