9-4 Solving Quadratics with Complex Numbers

Quadratic Formula Review

Get the equation in standard form, then plug in a, b, and c.

Standard form: $ax^2+bx+c=0$

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

Complex solutions of quadratic equations

$\sqrt{b^2-4ac}$

positive
$b^2-4ac>0$ Real solution

$b^2-4ac=0$ Real solution

negative
$b^2-4ac<0$ Complex solution (will have an i)

Solve using the Quadratic Formula.

$x^2-4x=-4$

$+4 \quad +4$

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

$a=1 \quad b=-4 \quad c=4$

$x=\frac{4\pm\sqrt{16-4(4)}}{2}$ 32 16 2 4

$x=\frac{4\pm\sqrt{32}}{2}$

$x=\frac{4\pm4\sqrt{2}}{2}$

$x=2\pm2\sqrt{2}$

$2x^2+12x+16=0$

$a=2 \quad b=12 \quad c=16$

$x=\frac{-12\pm\sqrt{144-4(16)(2)}}{4}$

$x=\frac{-12\pm\sqrt{16}}{4}$

$x=\frac{-12\pm4}{4}$ 3 1

$x=-3\pm1$

$=-3+1=-2$

$=-3-1=-4$

What kind of number is it if we get a negative inside the radical?

Complex / imaginary #'s

When we use the Quadratic Formula, we can get numbers that have both real and imaginary parts.

REMEMBER TO SIMPLIFY!

Solve using the Quadratic Formula.

$x^2 - 4x = -13$

$+13$

$x^2 - 4x + 13 = 0$

$a=1 \quad b=-4 \quad c=13$

$x = \frac{4 \pm \sqrt{16 - 4(13)}}{2}$

$x = \frac{4 \pm \sqrt{-36}}{2}$

$x = \frac{4 \pm 6i}{2}$

$x = 2 \pm 3i$

$x^2 + x + 5 = 0$

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

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

$x = \frac{-1 \pm \sqrt{-19}}{2}$

$x = \frac{-1 \pm i\sqrt{19}}{2}$

Solve for x: $x^2 + 3x - 4 = x - 9$

$-x \quad +9 \quad -x \quad +9$

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

$a=1 \quad b=2 \quad c=5$

$x = \frac{-2 \pm \sqrt{4 - 4(5)}}{2}$

$x = \frac{-2 \pm \sqrt{-16}}{2}$

$x = \frac{-2 \pm 4i}{2}$

$x = -1 \pm 2i$

When do I use which method?

When Graphing or putting a quadratic in vertex form: completing the square

Solving For x:

Trinomials $ax^2 + bx + c = 0$

If it is factorable- To FACTOR

If it is not factorable- Complete the square, when a is a GCF & b is even. Quadratic Formula always can use

Binomial

$ax^2 + c = 0$ No 'x' term- solve by square roots

$ax^2 + bx = 0$ No Constant- Factor out x & solve by Factoring

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Solve for x:

$x^2 - 20x + 100 = 0$

$-10 \quad -10$

$(x-10)(x-10) = 0$

$x = 10$

$x = \frac{20 \pm \sqrt{20^2 - 4(100)}}{2}$

$x = \frac{20 \pm \sqrt{400 - 400}}{2}$

$x = \frac{20 \pm \sqrt{0}}{2}$

$x = \frac{20}{2}$

$x = 10$

$3q^2 - 36 = 0$

$+36 \quad +36$

$\frac{3q^2}{3} = \frac{36}{3}$

$\sqrt{q^2} = \sqrt{12}$

$q = \pm\sqrt{12}$

$q = \pm 2\sqrt{3}$

$-(x-3)^2 + 12 = 0$

$-12 \quad -12$

$\frac{-(x-3)^2}{-1} = \frac{12}{-1}$

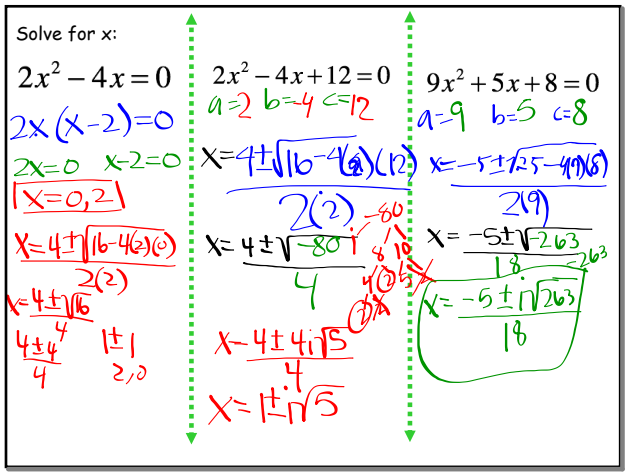
$\sqrt{(x-3)^2} = \sqrt{12}$

$x - 3 = \pm\sqrt{12}$

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

$+3 \quad +3$

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


Solve for x:
$2x^2 - 4x = 0$
$2x(x-2)=0$
$2x=0 \quad x-2=0$
$x=0,2$
$x=\frac{4\pm\sqrt{16-4(2)(0)}}{2(2)}$
$x=\frac{4\pm\sqrt{16}}{4}$
$\frac{4\pm4}{4} \quad 1\pm1$
$2,0$
$2x^2 - 4x + 12 = 0$
$a=2 \quad b=-4 \quad c=12$
$x=\frac{4\pm\sqrt{16-4(2)(12)}}{2(2)}$
$x=\frac{4\pm\sqrt{-80}}{4}$
$x=\frac{4\pm4i\sqrt{5}}{4}$
$x=1\pm i\sqrt{5}$
$9x^2 + 5x + 8 = 0$
$a=9 \quad b=5 \quad c=8$
$x=\frac{-5\pm\sqrt{25-4(9)(8)}}{2(9)}$
$x=\frac{-5\pm\sqrt{-263}}{18}$
$x=\frac{-5\pm i\sqrt{263}}{18}$