Good Morning

Please place cell phones in holder.

Please grab a marker from me and try warm-up on board assigned.

Solving by Quadratic Formula

Given a quadratic function in standard form:

$ax^2 + bx + c = 0$, *where* $a \neq 0$,

The discriminant is found by using: $b^2 - 4ac$

This value is used to determine the number of real solutions/zeros/roots/x-intercepts that exist for a quadratic equation.

Interpretation of the Discriminant ($b^2 - 4ac$)

- If $b^2 - 4ac$ is positive: 2 real solution
- If $b^2 - 4ac$ is zero: 1 real solution
- If $b^2 - 4ac$ is negative: 2 imaginary

1. Find the discriminant for the previous three functions:

a.) $f(x) = x^2 - 4x + 3$

a = 1 b = -4 c = 3

$b^2 - 4ac$

$(-4)^2 - 4(1)(3)$

Discriminant: 4

#. of real solutions: 2 real

b.) $f(x) = x^2 + 10x + 25$

a = 1 b = 10 c = 25

$b^2 - 4ac$

$(10)^2 - 4(1)(25)$

Discriminant: 0

# of real zeros: 1 real

c.) $f(x) = x^2 + x + 1$

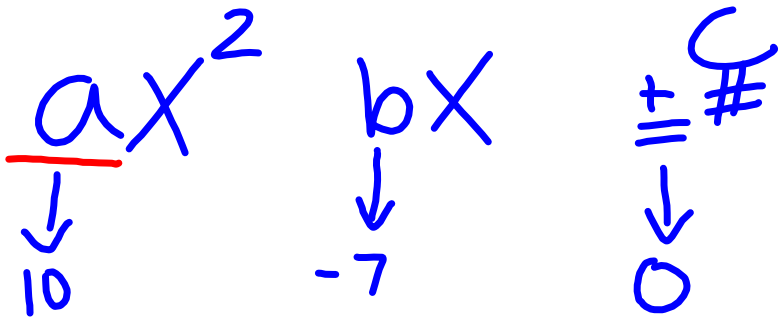
a = 1 b = 1 c = 1

$b^2 - 4ac$

$(1)^2 - 4(1)(1)$

Discriminant: -3

# of real roots: 2 imaginary


ax^2
bx
$\pm c$
10
-7
0

$x^2 = 16$

$x = 4 \quad x = -4$

$\sqrt{16} = 4$

$x^2 = 0$

$x = 0$

$\sqrt{0} = 0$

$x^2 = -25$

$x = \pm 5i$

$\sqrt{-25} = 5i$

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 is only used 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: $y = ax^2 + bx + c$

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

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

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

$b^2 - 4(a)(c)$

$(-13)^2 - 4(4)(3)$

121

$$\frac{-(-13) \pm \sqrt{121}}{2(4)}$$

Discriminant: 121

Solutions: 2 Solutions real

$$\frac{13 \pm 11}{8}$$

$$\frac{13+11}{8} \qquad \frac{13-11}{8} = \frac{2}{8}$$

$X = 3 \quad X = \frac{1}{4}$

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

$b^2 - 4ac$

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

0

$$\frac{-(6) \pm \sqrt{0}}{2(9)}$$

Discriminant: 0

Zeros: 1 Solution real

$$\frac{-6 \pm 0}{18} = \frac{-6}{18}$$

$X = \frac{-1}{3}$

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

$b^2-4(a)(c)$

$(8)^2-4(7)(3)$

-20

$\frac{-(8)\pm\sqrt{-20}}{2(7)}$ $i\sqrt{20}$ $2\wedge 10$ $2\wedge 5$

Discriminant: -20 -2imaginary

X = $\frac{-8\pm 2i\sqrt{5}}{14}$ $x=\frac{-4\pm i\sqrt{5}}{7}$

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

$-3x^2+2x+8=0$

$(2)^2-4(-3)(8)$

100

$\frac{-(2)\pm\sqrt{100}}{2(-3)}$

Discriminant: 100 2real

Roots: $\frac{-2\pm 10}{-6}$ $\frac{-2-10}{-6}$

$\frac{-2+10}{-6}=\frac{8}{-6}$ $x=-\frac{4}{3}$ $x=2$

5) $6x^2+3=10x$ a = 6 b = -10 c = 3

$6x^2-10x+3=0$

$(-10)^2-4(6)(3)$

28

$\frac{-(-10)\pm\sqrt{28}}{2(6)}$

Discriminant: _____

Solutions: _____

$\frac{10\pm 2\sqrt{7}}{12}$ $x=\frac{5\pm\sqrt{7}}{6}$

6) $\frac{1}{2}x^2+6x+13=0$ a = ½ b = 6 c = 13

$(6)^2-4(\frac{1}{2})(13)$

10

$\frac{-(6)\pm\sqrt{10}}{2(\frac{1}{2})}$

$x=\frac{-6\pm\sqrt{10}}{1}$

Discriminant: _____

Zeros: _____

$x=-6\pm\sqrt{10}$