S-A2 Algebra 2 Session 19 8/7

$x^2 - 2x - 16 = 0$ ← 1st make sure you have a zero

larger one

terms have different signs

$a = 1 \quad b = -2 \quad c = -16$

$1 * 16$
$2 * 8$
$4 * 4$

$\_\_ * \_\_ = -16$
$\_\_ + \_\_ = -2$

Quadratic formula

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

$$\frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-16)}}{2(1)}$$

$$\frac{2 \pm \sqrt{4 + 64}}{2} = \frac{2 \pm \sqrt{68}}{2}$$

$\sqrt{68}$
$\sqrt{4}\ \sqrt{17}$
$2\sqrt{17}$

$\div 2 \quad \div 2$
$$\frac{2 \pm 2\sqrt{17}}{2 \div 2}$$

$$1 \pm \sqrt{17}$$

Perfect Squares

1, 4, 9, 16, 25, 36, 49, 64, 81, 100...

$1 + \sqrt{17}$, $1 - \sqrt{17}$

5.123 | -3.123

zeros / roots

$x^2 - 2x - 16 = 0$

Vertex (h, k) Remember Average the zeros!

$a = 1$
$b = -2$
$c = -16$

$$h = \frac{-b}{2a} = \frac{-(-2)}{2(1)} = \frac{2}{2} = 1$$

$$\frac{5.123 + (-3.123)}{2}$$

$$\frac{2}{2} = 1$$

Find k by plugging h

$h = 1$

$x^2 - 2x - 16$

$(1)^2 - 2(1) - 16$

$1 - 2 - 16 = -17$

vertex:

$(1, -17)$

up to 2 solutions

$x^2 + 4x - 18 = 0$

Find the zeros

$a = 1 \quad b = 4 \quad c = -18$

Quadratic formula

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

$$\frac{-4 \pm \sqrt{(4)^2 - 4(1)(-18)}}{2(1)}$$

$$\frac{-4 \pm \sqrt{16 + 72}}{2} = \frac{-4 \pm \sqrt{88}}{2}$$

$\sqrt{88}$

$\sqrt{4}\ \sqrt{22}$

$2\sqrt{22}$

$\frac{-4 \pm 2\sqrt{22}}{2}$ ÷2 ÷2

$-2 \pm \sqrt{22}$ or $-2 + \sqrt{22}$ and $-2 - \sqrt{22}$

Discriminant conveys how many Zeros.

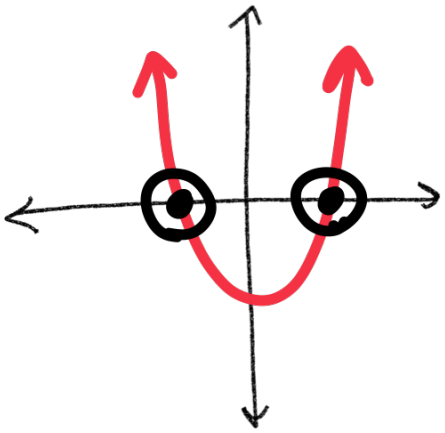
$$b^2-4ac$$

If $b^2-4ac > 0$ [positive] → 2 zeros

If $b^2-4ac = 0$ [0] → 1 zero

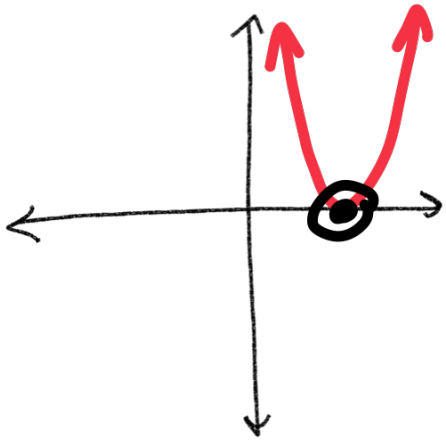
If $b^2-4ac < 0$ [negative] → 0 zeros
no real solutions

2 zeros



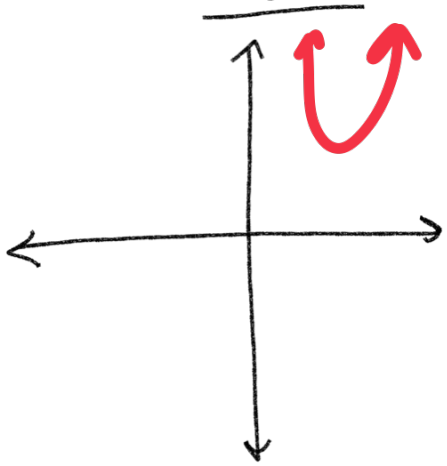
$b^2-4ac > 0$

1 zero



$b^2-4ac = 0$

0 zeros



$b^2-4ac < 0$

$x^2 + 4x + 12$

$a=1 \quad b=4 \quad c=12$

Quadratic formula

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

Discriminant: b^2-4ac

$$\frac{-4 \pm \sqrt{(4)^2-4(1)(12)}}{2(1)} = \frac{-4 \pm \sqrt{16-48}}{2} = \frac{-4 \pm \sqrt{-32}}{2}$$

Discriminant: -32

0 zeros

$$\frac{-4 \pm \sqrt{-32}}{2} \qquad \sqrt{-32} = \sqrt{32} \cdot \sqrt{-1}$$

$$\sqrt{-1} = i$$

$$\sqrt{-32} = i\sqrt{32}$$

$\sqrt{32}$

$\sqrt{16} \quad \sqrt{2}$

$4\sqrt{2}$

$$\frac{-4 \pm \sqrt{-32}}{2} = \frac{-4 \pm 4i\sqrt{2}}{2} \quad (\div 2)$$

$$\boxed{-2 \pm 2i\sqrt{2}}$$

$-2+2i\sqrt{2}$ and $-2-2i\sqrt{2}$

Quadratic formula

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

Discriminant: How many zeros/roots

h of vertex

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

Find the zeros

Find the discriminant

$a = 3 \quad b = 2 \quad c = 8$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-2 \pm \sqrt{(2)^2 - 4(3)(8)}}{2(3)}$$

$$\frac{-2 \pm \sqrt{-92}}{6}$$

neg → $\emptyset$ zeros

Discriminant:

$b^2 - 4ac$

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

$4 - 96$

-92

$$\frac{-2 \pm 2i\sqrt{23}}{6} \quad \begin{matrix} \div 2 \\ \div 2 \end{matrix}$$

$$\frac{-1 \pm i\sqrt{23}}{3}$$

$\sqrt{-92}$

$\sqrt{-1} \cdot \sqrt{92}$

i

$\sqrt{4} \quad \sqrt{23}$

$2\sqrt{23}$

How many real solutions: [Use discriminant]

$x^2 + 7x - 10 = -3$

$+3 \quad +3$

$x^2 + 7x - 7 = 0$

$b^2 - 4ac$

$(7)^2 - 4(1)(-7)$

$49 + 28 = 77$

(+) → 2

(∅) → 1

(−) → 0

positive → 2 solutions

$i = \sqrt{-1}$

$i^2 = i \cdot i = \sqrt{-1} \cdot \sqrt{-1} = -1$ $\quad i^2 = -1$

$i^3 = i^2 \cdot i = -1 \cdot i = -i$ $\quad i^3 = -i$

$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$ $\quad i^4 = 1$

$i^5 = i^4 \cdot i = 1 \cdot i = i$

$i = i$	$i^5 = i$	$i^9 = i$	remainder 1
$i^2 = -1$	$i^6 = -1$	$i^{10} = -1$	remainder 2
$i^3 = -i$	$i^7 = -i$	$i^{11} = -i$	remainder 3
$i^4 = 1$	$i^8 = 1$	$i^{12} = 1$	remainder 0

i^{735}

$4 \overline{)735}$ $\quad 183$

-4

33

-32

15

-12

3

$i^{735} = -i$

$(-5+4i)^2 = (-5+4i)(-5+4i)$

FOIL

$25 - 20i - 20i + 16i^2$

$16(-1)$

$i^2 = -1$

$25 - 40i - 16$

$\boxed{9 - 40i}$