Quadratic:

Standard Form:

* $f(x) = ax^2 + bx + c$

* vertex = (x, y)
  - $x = -b/2a$ → axis of symmetry (abscissa)
  - $y = f(x)$ → Max, Min, Range (y-ordinate)

* Sum of roots = $-b/a$

* Product of roots = c/a

* Factored Form:

$f(x) = (x - a)(x - b)$

roots = a, b

* vertex = (x, y)
  - $x = \frac{a+b}{2}$
  - $y = f(x)$

* Sum of roots = $a + b$

* Product of roots = ab

* Vertex Form:

$f(x) = (x - h)^2 + k$

vertex = (h, k)

$$f(x) = (x-2)^2 + 3$$

vertex = (2, 3)

$$f(x) = (x+5)^2$$

vertex = (−5, 0)

$$f(x) = x^2 - 7$$

vertex = (0, −7)

---

* what is the solution: ?

---

* Factoring
* Formula → $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$
* Calculator.

---

* Binomial: 2 Terms
  - Diff of two squares.
  - Sum and diff of two cubes.

* $x^2 - y^2 = (x+y)(x-y)$

* $x^2 - 9 = (x+3)(x-3)$

* $4x^2 - 25 = (2x-5)(2x+5)$

* $2x^2 - 32 = 2(x^2-16)$

  $2(x-4)(x+4)$

$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$

$x^3 - 8 = (x - 2)(x^2 + 2x + 4)$

$x^3 + 27 = (x + 3)(x^2 - 3x + 9)$

---

* Trinomial → 3 Terms.

$x^2 - 5x - 6 = (x + 1)(x - 6)$

$x^2 - 7x + 10 = (x - 2)(x - 5)$

$2x^2 - 7x + 6 =$ $x^2 - 7x + 12$

$(x - \frac{3}{2})(x - \frac{4}{2})$

$(2x - 3)(x - 2)$

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

$\sqrt{x^2} + 10x + \sqrt{25} = (x + 5)^2$

$(x + y)^2 = x^2 + 2xy + y^2$

$(x + 5)^2 = x^2 + 10x + 25$

Grouping → 2 x 2

3 x 1

$$x^3 - 3x^2 + 9x - 27$$

$$(x^3 - 3x^2) + (9x - 27)$$

$$x^2(x-3) + 9(x-3)$$

$$(x-3)(x^2+9)$$

If $a = c + d$ ←

$$x^2 - c^2 - 2cd - d^2$$

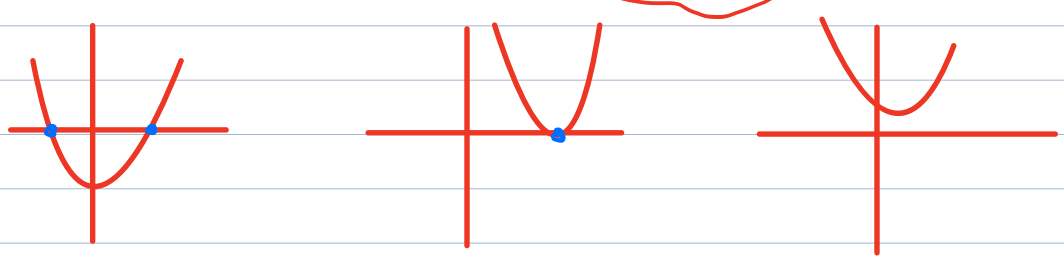
$$x^2 - (c^2 + 2cd + d^2)$$

$$x^2 - (c+d)^2$$

$$x^2 - a^2 = (x-a)(x+a)$$

How many solution? — Intersect with x-axis.

Discriminant $b^2 - 4ac$



2 real diff
$b^2 - 4ac > 0$

one real
2 real equal
$b^2 - 4ac = 0$

No real.
2 Complex
$b^2 - 4ac < 0$

How many Solution for

$$49x^2 - 144x - 100 = 0$$

$b^2 - 4ac = (-144)^2 - 4(49)(-100)$

$+ve \qquad +ve = +ve > 0$

$\therefore$ 2 real diff

How many real Solution ?

$$2x(x^2+4)(mx^2 - x - m) = 0$$

$2x = 0$	$x^2 + 4 = 0$	$mx^2 - x - m = 0$
$x = 0$ ✓	$x^2 = -4$	$b^2 - 4ac$
	$x = \pm\sqrt{-4}$	$(-1)^2 - 4(m)(-m)$
	✗	$1 + 4m^2 \rightarrow +ve$
		2 real diff.

$= 3$ Solutions
