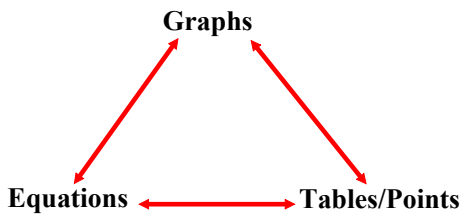
2.4 - Applications of Parabolas - Part 4 (Standard Form)

What's the purpose of all of this?



Writing an Equation of a Parabola

What are you given?

- Vertex
- A 2nd point

→ Vertex Form: $y = a(x-h)^2 + k$

- Both x-intercepts
- A 3rd point

→ Intercept Form: $y = a(x-p)(x-q)$

- 3 points
- No vertex or intercepts

→ Standard Form: $y = ax^2 + bx + c$

Example 1:
Write an equation of the parabola that passes through the point (8 ,3) and has a vertex at (4,-1).

POINT : $(\overset{x}{8}, \overset{y}{3})$
VERTEX: $(\underset{h}{4}, \underset{k}{-1})$

$y = a(x-h)^2 + k$

$3 = a(8-4)^2 - 1$

$3 = 16a - 1$
$+1 \qquad +1$

$\frac{4}{16} = \frac{16a}{16}$

$a = 0.25$ or $\frac{1}{4}$

$\boxed{y = \frac{1}{4}(x-4)^2 - 1}$

Example 2:
Write an equation of the parabola that has x-intercepts of 9 and 1 and passes through the point (0,-18).

X-INT: 9 AND 1
POINT: $(\overset{x}{0}, \overset{y}{-18})$

$y = a(x-p)(x-q)$

$-18 = a(0-9)(0-1)$

$-18 = a(-9)(-1)$

$\frac{-18}{9} = \frac{9a}{9}$

$a = -2$

$\boxed{y = -2(x-9)(x-1)}$

Example 3:
Write an equation of the parabola that passes through the points (-1, 4), (0, 1) and (2, 7).

POINTS: $(\overset{x}{-1}, \overset{y}{4})$, $\boxed{(\overset{x}{0}, \overset{y}{1})}$, $(\overset{x}{2}, \overset{y}{7})$

$y = ax^2 + bx + c$

$4 = a(-1)^2 + b(-1) + c$
$4 = 1a - 1b + c$ ①

$1 = \cancel{a(0)^2} + \cancel{b(0)} + c$
$c = 1$ ②

$7 = a(2)^2 + b(2) + c$
$7 = 4a + 2b + c$ ③

① $1a - 1b + c = 4$
② $\boxed{c = 1}$
③ $4a + 2b + \cancel{c} = 7$
$c = 1$

Ⓐ $a - b = 3$
Ⓑ $4a + 2b = 6$

SOLVE!

$1a - 1b + c = 4$

$1a - 1b + 1 = 4$
$-1 \qquad -1$

$1a - 1b = 3$

Solve the following system of equations.

$$x + y - 2z = 5$$
$$-x + 2y + z = 2$$
$$2x + 3y - z = 9$$