The **_Graphing Quadratics_** simulation allows students to explore the graph of a quadratic function.

Explore Screen

In the Explore screen, students can use sliders to investigate the influence each term of a quadratic function has on the graph of the parabola.

OBSERVE the curve change as the coefficients change

CONTROL each coefficient of a quadratic function

VIEW the individual terms of the function

Standard Form Screen

In the Standard Form screen, the emphasis is on the vertex, axis of symmetry, and roots. Students can adjust the function but the values are limited to integers.
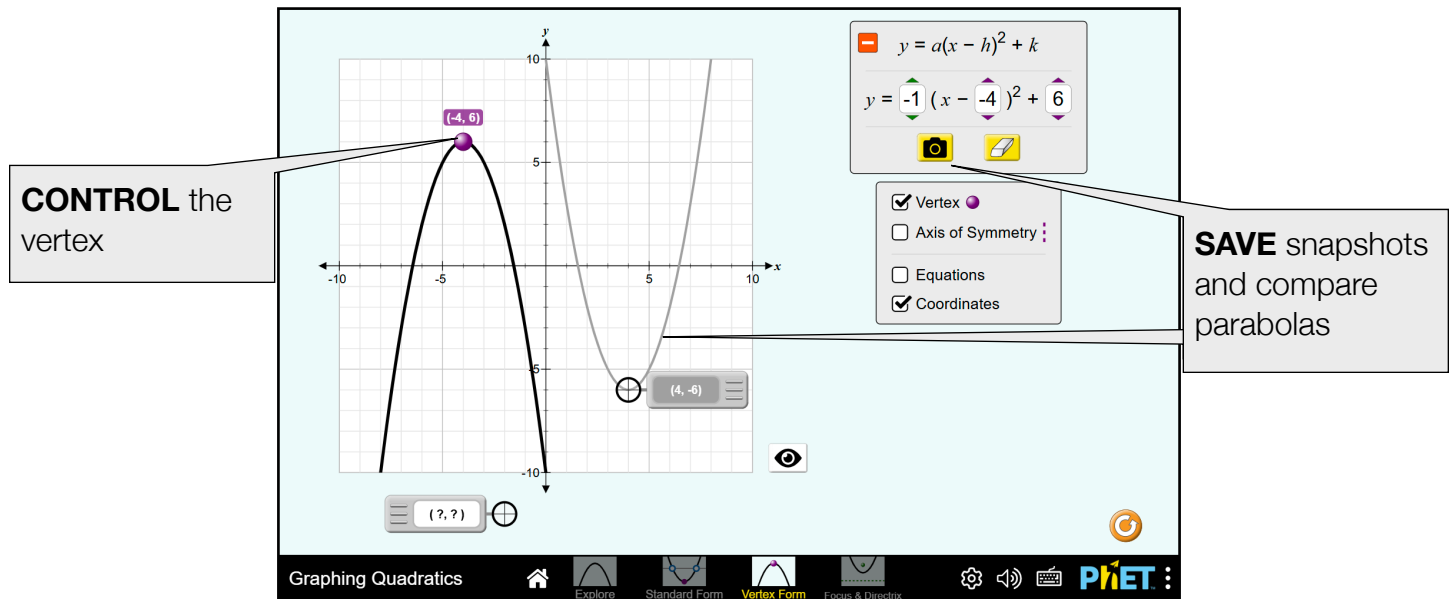
IDENTIFY the parts of a parabola

LOCATE points on curves

VIEW the vertex, axis of symmetry, and roots

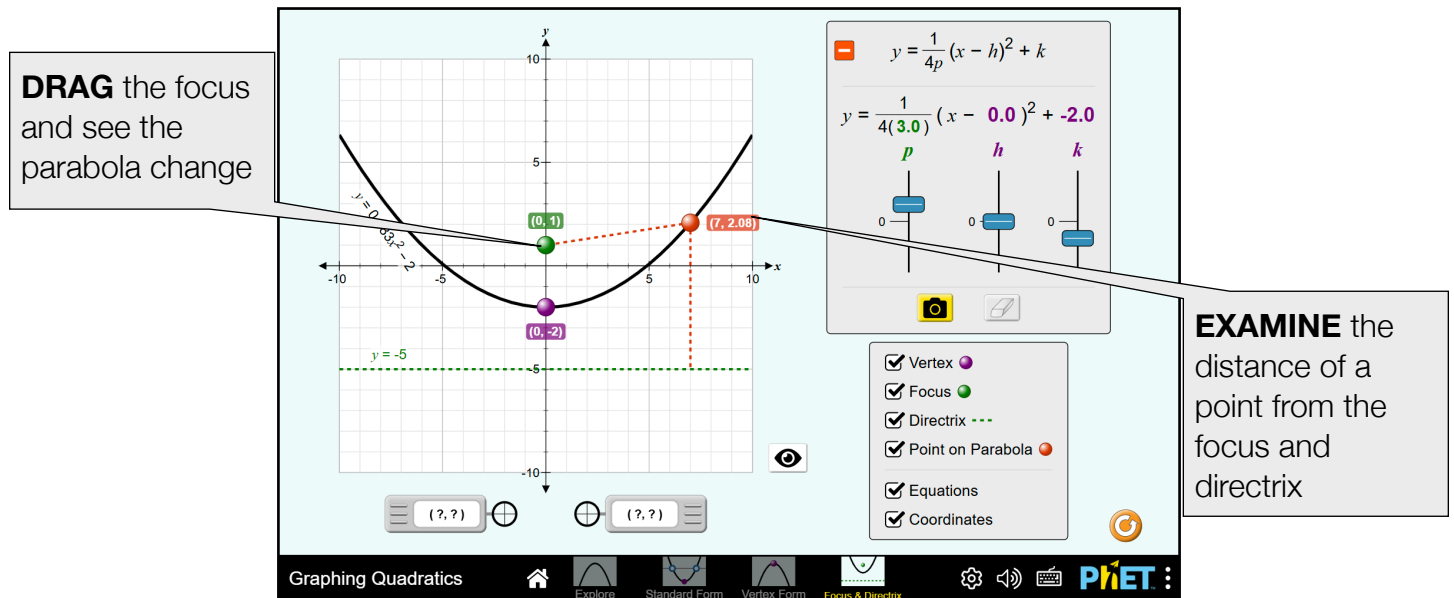**SHOW/HIDE** all curves on the graph

Vertex Form Screen

In the Vertex Form screen, students explore transformations of a parabola and identify the relationship between the graphed parabola and the quadratic function.

CONTROL the vertex

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

$y = \boxed{-1}\,(\,x - \boxed{-4}\,)^2 + \boxed{6}$

- ☑ Vertex ●
- ☐ Axis of Symmetry ⋮
- ☐ Equations
- ☑ Coordinates

(-4, 6)

(4, -6)

SAVE snapshots and compare parabolas

(?, ?)

Graphing Quadratics — Explore — Standard Form — **Vertex Form** — Focus & Directrix — PhET

Focus & Directrix Screen

In the Focus & Directrix screen, students generate a parabola based on a vertex and focus.

DRAG the focus and see the parabola change

$y = \dfrac{1}{4p}(x - h)^2 + k$

$y = \dfrac{1}{4(\mathbf{3.0})}(\,x - \mathbf{0.0}\,)^2 + \mathbf{-2.0}$

$\quad p \qquad\qquad h \qquad\qquad k$

$y = 0.083x^2 - 2$

(0, 1)

(7, 2.08)

(0, -2)

$y = -5$

- ☑ Vertex ●
- ☑ Focus ●
- ☑ Directrix - - -
- ☑ Point on Parabola ●
- ☑ Equations
- ☑ Coordinates

EXAMINE the distance of a point from the focus and directrix

(?, ?)   (?, ?)

Graphing Quadratics — Explore — Standard Form — Vertex Form — **Focus & Directrix** — PhET

Customization Options

Query parameters allow for customization of the simulation, and can be added by appending a `?` to the sim URL, and separating each query parameter with a '`&`'. The general URL pattern is:

`…html?queryParameter1&queryParameter2&queryParameter3`

For example, in Graphing Quadratics, if you only want to include the 1st and 2nd screens (`screens=1,2`), with the 2nd screen open by default (`initialScreen=2`) use:

https://phet.colorado.edu/sims/html/graphing-quadratics/latest/graphing-quadratics_all.html?screens=1,2&initialScreen=2

To run this in Spanish (`locale=es`), the URL would become:

https://phet.colorado.edu/sims/html/graphing-quadratics/latest/graphing-quadratics_all.html?locale=es&screens=1,2&initialScreen=2

⚙ Indicates this customization can be accessed from the Preferences menu within the simulation.

Query Parameter and Description	Example Links

`screens` - specifies which screens are included in the sim and their order. Each screen should be separated by a comma. For more information, visit the Help Center.	`screens=1`
	
	`screens=2,1`

`initialScreen` - opens the sim directly to the specified screen, bypassing the home screen.	`initialScreen=1` `initialScreen=3`
⚙ `locale` - specify the language of the simulation using ISO 639-1 codes. Available locales can be found on the simulation page on the Translations tab. Note: this only works if the simulation URL ends in "_all.html".	`locale=es` (Spanish) `locale=fr` (French)
`allowLinks` - when `false`, disables links that take students to an external URL. Default is `true`.	`allowLinks=false`
`supportsPanAndZoom` - when `false`, disables panning and zooming using pinch-to-zoom or browser zoom controls. Default is `true`.	`supportsPanAndZoom=false`

Suggestions for Use

- Describe how changing the coefficients of a quadratic function changes the graph of the function.
- Predict how the graph of a parabola will change if the coefficients or constant are varied.
- Identify the vertex, axis of symmetry, roots, and directrix for the graph of a quadratic equation.
- Use the vertex form of a quadratic function to describe the graph of the function.
- Describe the relationship between the focus and directrix and resulting parabola.
- Predict the graph of a parabola given a focus and directrix.

Sample Challenge Prompts
- Play on the Explore screen for 5 minutes. How do a, b, and c impact the graph of the parabola?
  - Describe the effect a has on the graph.

- Describe the effect b has on the graph.
- Describe the effect c has on the graph.
- Using the Standard Form screen, describe how many roots a quadratic function has. Is it possible to ever have more? Is it possible to ever have less?
- Using the Focus & Directrix screen, describe the relationship between the focus, vertex, and directrix.
- Describe the effect p has on the graph.
  - What would the parabola look like if $p=0$?
  - What would the parabola look like if p gets very large?

See all published activities for Graphing Quadratics here.
For more tips on using PhET sims with your students, see Tips for Using PhET.