

Basic Quadratic

We know when students are just beginning their study of algebra, the basic concepts can be difficult to grasp. These activities are written for teachers to use in their basic algebra classes.

When you find other helpful exercises, add these to your own eActivities.

Good exercises encourage students!

This file includes eActivities on:

Linear and Quadratic – See how these are different in both a table and graph.

Graph $y=ax^2$ – Alter the equation and watch the graph reflect the changes.

Graph $y=ax^2+bx+c$ – Same as before! Change the equation and the graph is revised.

Discriminant – Is the Discriminant odd, even, or zero?

Find the Roots – How many roots can you find...zero, one, or more than one?

Solve $x^2=a$ – Discover the solutions using algebra and graphing. Also, learn how CAS can help.

Completing the Square – Let your ClassPad help you!

The Factored Form – Make use of the rFactor() function to find the factored form.

Find the Vertex – First, graph the equation, and then use the Analysis/G-Solve menus to find the vertex.

The Vertex Form – Verify will help you find the vertex form for these equations.

Linear and Quadratic

See how these are different in both a table and graph.

The left screenshot shows a ClassPad window titled "Linear and Quadratic". It contains the following text: "<Example>", " $y=x, y=x^2$ ", "Graph window", "Open the graph window and tap the Table button.", "On the table window tap the Graph button.", "You can see the difference between the two equations.", "Try your own." The right screenshot shows a ClassPad window titled "Edit Zoom Analysis". It contains a table with the following data:

x	y1	y2
-5	-5	25
-4	-4	16
-3	-3	9
-2	-2	4
-1	-1	1

Below the table is a graph showing a coordinate plane with a parabola opening upwards, representing $y=x^2$. The x-axis is labeled with -5.

Graph $y=ax^2$

Alter the equation and watch the graph reflect the changes.

The screenshot shows a ClassPad window titled "Quadratic Equation". It contains the following text: " $y=ax^2$ ", "Open the window-->", "Change the equation and tap EXE to change the graph.", " $y=x^2$ ".

Graph $y=ax^2+bx+c$

Same as before! Change the equation and the graph is revised.

File Edit Insert Action

Quadratic Equation

$$y = ax^2 + bx + c$$

Open the window-->

Change the equation and tap EXE to change the graph.

$$y = x^2 + x - 1$$

Assist Cplx Rad

Discriminant

Is the Discriminant odd, even, or zero?

File Edit Insert Action

Discriminant

<Example>

$$y = 3x^2 - 2x - 1$$

Graph

$$y = ax^2 + bx + c$$

Discriminant is

$$b^2 - 4ac \mid a=3 \mid b=-2 \mid c=-1$$

16

Try your own.

$$y = -3x^2 - 2x$$

Discriminant

Graph

Alg Standard Cplx Rad

File Edit Insert Action

Discriminant

$$y = -3x^2 - 2x - 1$$

Discriminant

Graph

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

Discriminant

Graph

Alg Standard Cplx Rad

Find the Roots

How many roots can you find...zero, one, or more than one?

File Edit Insert Action

Find the Roots

<Example>

Find the roots of

$$y = 2x^2 - 3x - 1$$

Graph window --->

Open the Graph window, drag and drop the equation to it. On the Graph window, tap Analysis/G-Solve/Root. You will find the roots.

Try your own.

Find the roots of

$$y = -2x^2 - 3x + 1$$

Alg Standard Real Rad

Edit Zoom Analysis

Find the Roots

<Example>

Find the roots of

$$y = 2x^2 - 3x - 1$$

Graph window --->

Open the Graph window.

Root

$$xc = -0.280776 \quad yc = 0$$

$$y = 2x^2 + (-3)x - 1$$

Rad Real

Solve $x^2=a$

Discover the solutions using algebra and graphing. Also, learn how CAS can help.

Solve $x^2=a$

<Example>
 $20=x^2+4$

Calculator

From the calculation, $x=4$ and $x=-4$.

Rewrite the equation and draw the graph.

Calculator

The equation is $y=x^2-16$

Graph window

x-intercepts are -4, 4.

Alg Standard Real Rad

Solve $x^2=a$

<Example>
 $20=x^2+4$

Calculator

From the calculation, $x=4$ and $x=-4$.

$20=x^2+4$

$ans-4$ $20=x^2+4$

\sqrt{ans} $16=x^2$

$4=|x|$

Alg Standard Real Rad

Solve $x^2=a$

Graph window

x-intercepts are -4, 4.

Hint to use CAS

Try your own.

$40=x^2+4$

Calculator

$65=x^2-16$

Calculator

$x^2+5=2x^2-16$

Calculator

Alg Standard Real Rad

Completing the square

Let your ClassPad help you!

Completing the square

<Example>
 Find the solution for
 $3 \cdot x^2+24 \cdot x-8=22$

Add 8.

$3 \cdot x^2+24 \cdot x=30$

Divide by 3.

$x^2+8 \cdot x=10$

Add 16.

$x^2+8 \cdot x+16=26$

Factor the equation.

$(x+4)^2=2 \cdot 13$

Take the square.

Alg Standard Real Rad

Completing the square

$3 \cdot x^2+24 \cdot x-8=22$

$ans+8$ $3 \cdot x^2+24 \cdot x-8=22$

$ans+16$ $3 \cdot x^2+24 \cdot x=30$

expand(ans/3) $x^2+8 \cdot x=10$

$ans+16$ $x^2+8 \cdot x+16=26$

factor(ans) $(x+4)^2=2 \cdot 13$

\sqrt{ans} $|x+4|=\sqrt{26}$

absExpand(ans) $x+4=\sqrt{26}$ or $x+4=-\sqrt{26}$

Alg Standard Real Rad

Completing the square

Hint to use CAS

Try your own.

$3x^2-24x-24=27$

Calculator

$3x^2-24x-10=x^2-4x+12$

Calculator

$2x^2-11x+10=x^2-21x-15$

Calculator

$-2x^2+11x-10=x^2+2x$

Calculator

Alg Standard Real Rad

The Factored Form

Make use of the rFactor() function to find the factored form.

The Factored Form

<Example>
 Find the factored form for $y=1.2x^2-1.5x+0.3$

Use rFactor function.

$rFactor(1.2x^2-1.5x+0.3)$

$6 \cdot \left(x-\frac{1}{4}\right) \cdot (x-1)$

Then the equation is

$y=\frac{6}{5} \cdot \left(x-\frac{1}{4}\right) \cdot (x-1)$

Try your own.
 Find the factored form

Alg Standard Real Rad

The Factored Form

Use rFactor function.

$rFactor(1.2x^2-1.5x+0.3)$

$6 \cdot \left(x-\frac{1}{4}\right) \cdot (x-1)$

Then the equation is

$y=\frac{6}{5} \cdot \left(x-\frac{1}{4}\right) \cdot (x-1)$

Try your own.
 Find the factored form for $y=1.2x^2-1.5x+0.3$,
 $y=2x^2-7x+3$, $y=\frac{x^2}{4}-\frac{9}{4}$.

Calculator

Alg Standard Real Rad

Find the Vertex

First, graph the equation, and then use the Analysis/G-Solve menus to find the vertex.

Find the Vertex

<Example>
Find the vertex of
 $y=2x^2-3x-1$.

Graph window --->

Open the Graph window,
drag and drop the
equation to it. On the
Graph window, tap
Analysis/G-Solve/Min. You
will find the vertex.

Try your own.
Find the vertex of
 $y=x^2+3x+1$,

Alg Standard Real Rad

Find the Vertex

<Example>
Find the vertex of
 $y=2x^2-3x-1$

Graph window --->

Open the Graph window,

$x_c=0.75$ $y_c=-2.125$ Min

$y=2 \cdot x^2+(-3) \cdot x-1$

Rad Real

The Vertex Form

Verify will help you find the vertex form for these equations.

The Vertex Form

<Example>
Find the vertex form for
 $y=2x^2-3x-1$.

Change the form.

$$2 \cdot x^2 - 3 \cdot x - 1$$

$$= 2 \cdot \left(x^2 - \frac{3}{2} \cdot x \right) - 1$$

$$= 2 \cdot \left(\left(x - \frac{3}{4} \right)^2 - \left(\frac{3}{4} \right)^2 \right) - 1$$

$$= 2 \cdot \left(x - \frac{3}{4} \right)^2 - 2 \cdot \left(\frac{3}{4} \right)^2 - 1$$

$$= 2 \cdot \left(x - \frac{3}{4} \right)^2 - \frac{18}{16} - 1$$

Alg Standard Real Rad

File Edit Action

$$2 \cdot x^2 - 3 \cdot x - 1$$

$$= 2 \cdot \left(x^2 - \frac{3}{2} \cdot x \right) - 1$$

$$= 2 \cdot \left(\left(x - \frac{3}{4} \right)^2 - \left(\frac{3}{4} \right)^2 \right) - 1$$

$$= 2 \cdot \left(x - \frac{3}{4} \right)^2 - 2 \cdot \left(\frac{3}{4} \right)^2 - 1$$

$$= 2 \cdot \left(x - \frac{3}{4} \right)^2 - \frac{18}{16} - 1$$

$$= 2 \cdot \left(x - \frac{3}{4} \right)^2 - \frac{34}{16}$$

$$= 2 \cdot \left(x - \frac{3}{4} \right)^2 - \frac{17}{8}$$

$$= 0$$

Eq: $2 \cdot x^{(2)} - 3 \cdot x - 1$

File Edit Insert Action

$(x, y) = \left(\frac{3}{4}, -\frac{17}{8} \right)$

Calculator $f(x) =$

Try your own.
Find the vertex form for
 $y=-2x^2+3x+2$

Calculator $f(x) =$

$y=2x^2+4x+2$

Calculator $f(x) =$

$y=2x^2+3x+3$

Calculator $f(x) =$

Alg Standard Real Rad