

3.1 Quadratic Functions

GOALS:

1. Recognize standard form of quadratic function.
2. Use standard form to determine the vertex.
3. Sketch quadratic functions using the vertex, y-intercept, other easy points, and symmetry.
4. Find the vertex of the quadratic function when not in standard form.

Study 3.1 CVC # 1-5 # 1-17; 21, 25, 29, 33, 37; 39 - 49; 57*, 65

Parabola: Graphing Standard Form

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3.1 Quadratic Functions

General form:

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

Quadratic:

1. order is 2, $a \neq 0$
2. graphs as parabola

Parabola: Graphing Standard Form

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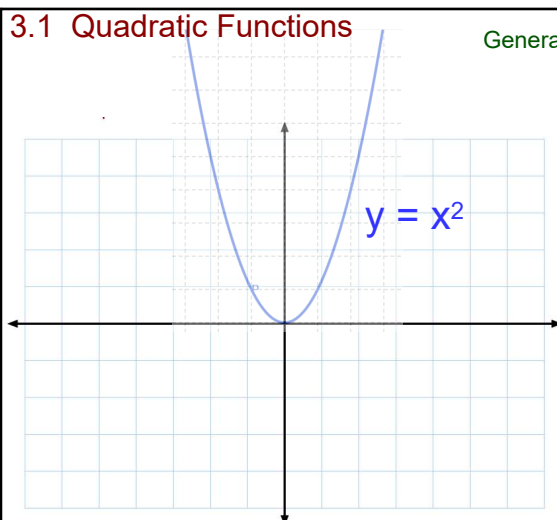
3.1 Quadratic Functions

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3.1 Quadratic Functions

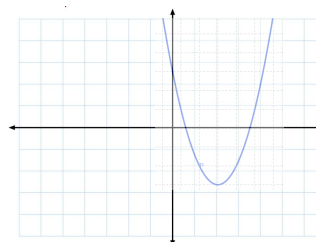
Does $f(x)$ graph as a parabola?

$$f(x) = (x-1)^2 - 2$$

$$\begin{aligned} f(x) &= x^2 - 2x + 1 - 2 \\ &= x^2 - 2x - 1 \end{aligned}$$

Does $f(x)$ graph as a parabola?

YES



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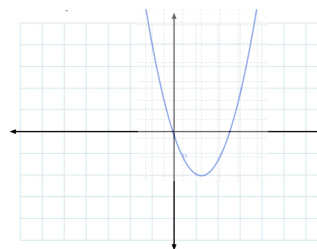
3.1 Quadratic Functions

Which is easier to graph?

$$f(x) = (x-1)^2 - 2$$

OR

$$f(x) = x^2 - 2x - 1$$



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3.1 Quadratic Functions

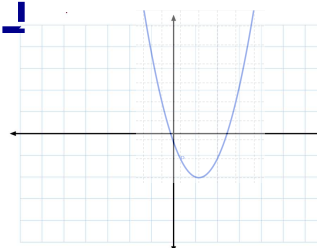
Standard Form:

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

where $a \neq 0$, and (h, k) is vertex

For $f(x) = (x-1)^2 - 2$

$a = \underline{\hspace{1cm}}$ and $V(\underline{\hspace{1cm}}, \underline{\hspace{1cm}})$



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3.1 Quadratic Functions

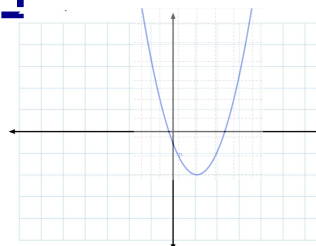
Standard Form:

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

where $a \neq 0$, and (h, k) is vertex

For $f(x) = (x-1)^2 - 2$

$a = 1$ and $V(1, -2)$



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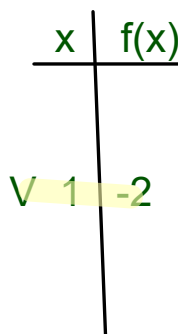
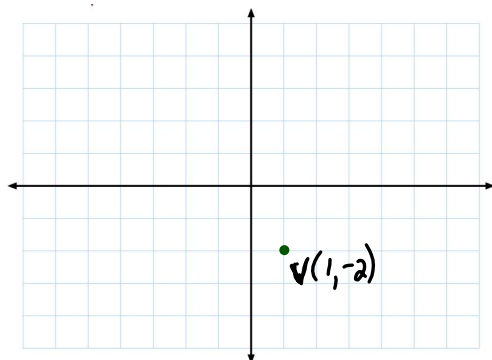
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3.1 Quadratic Functions

To graph: $f(x) = (x-1)^2 - 2$

1. Start with $V(1, -2)$



D: all x
R: $y \geq -2$

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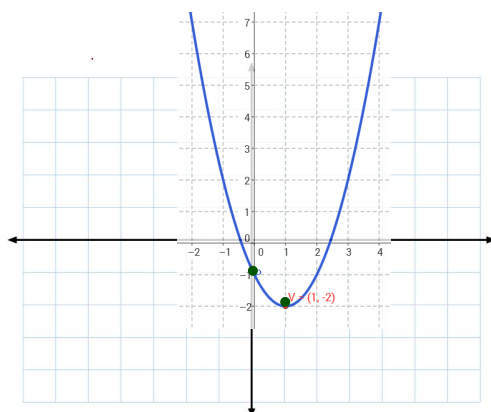
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3.1 Quadratic Functions

To graph: $f(x) = (x-1)^2 - 2$

1. Start with $V(1, -2)$
2. Find y-intercept



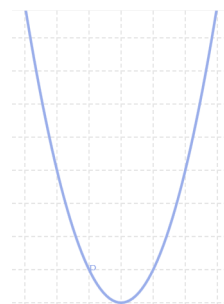
x	f(x)
0	-1
V 1	-2

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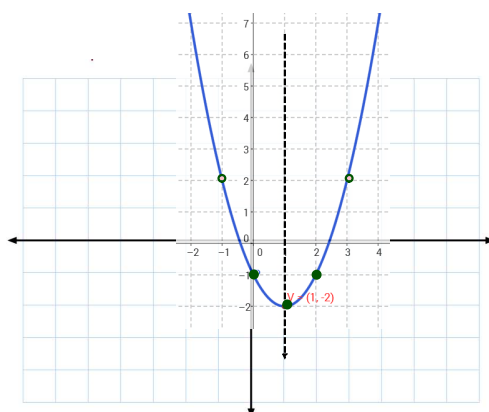
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3.1 Quadratic Functions

To graph: $f(x) = (x-1)^2 - 2$

1. Start with $V(1, -2)$
2. Find y-intercept
3. Use symmetry to find other points.



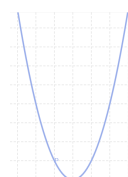
x	f(x)
-1	2
0	-1
V 1	-2
2	-1
3	2

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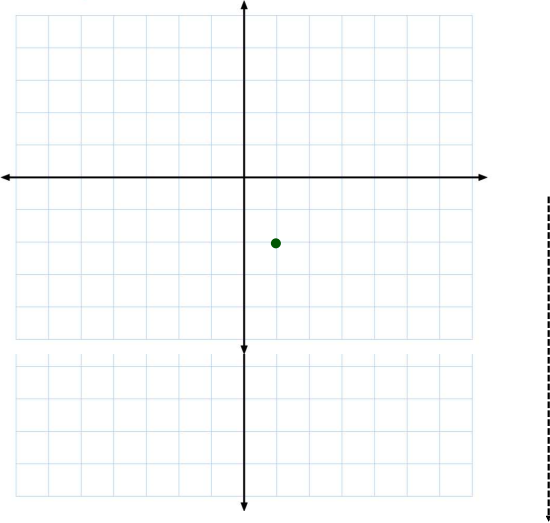
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3.1 Quadratic Functions

$f(x) = -2(x-1)^2 - 2$
1. Start with $V(1, -2)$
2. Find y -intercept

x	f(x)
0	-2
1	-2



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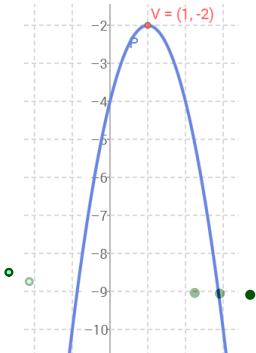
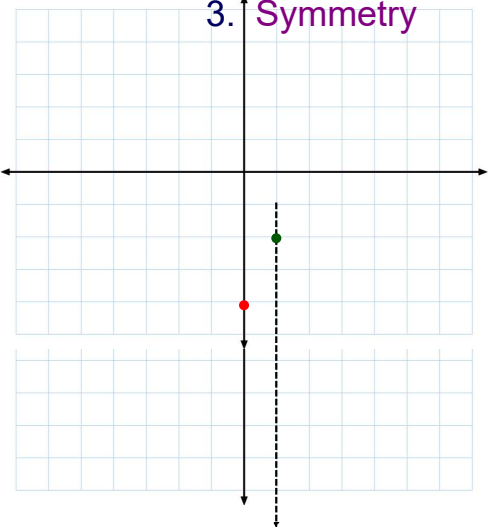
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3.1 Quadratic Functions

$f(x) = -2(x-1)^2 - 2$
1. Start with $V(1, -2)$
2. Find y -intercept
3. Symmetry

x	f(x)
0	-4
1	-2
2	-4



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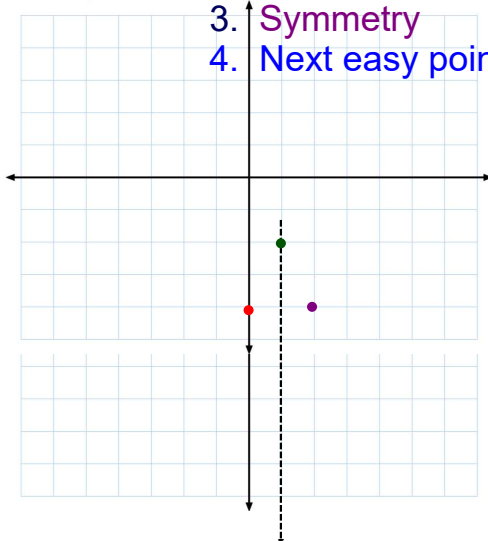
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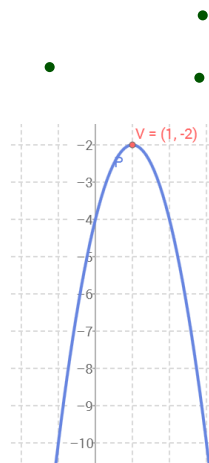
3.1 Quadratic Functions

$$f(x) = -2(x-1)^2 - 2$$

1. Start with $V(1, -2)$
2. Find y -intercept
3. Symmetry
4. Next easy point.



x	f(x)
-1	-10
0	-4
V 1	-2
2	-4
3	-10



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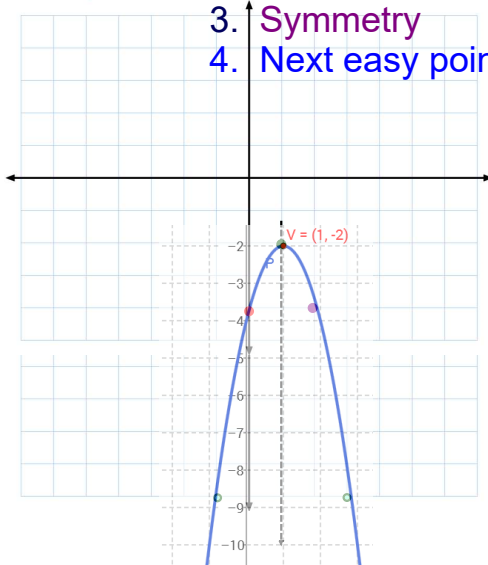
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3.1 Quadratic Functions

$$f(x) = -2(x-1)^2 - 2$$

1. Start with $V(1, -2)$
2. Find y -intercept
3. Symmetry
4. Next easy point.



x	f(x)
-1	-10
0	-4
V 1	-2
2	-4
3	-10



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3.1 Quadratic Functions

To Graph a Quadratic Function:

1. If $a > 0$, opens up. Has a minimum.
If $a < 0$, opens down. Has a maximum.
 2. Find vertex.
If std form, use equation to get $V(h, k)$
If not, use $x_v = \frac{-b}{2a}$; then substitute to find y_v
 $f(x) = ax^2 + bx + c$
 3. Find y-intercept
 4. Find x-intercepts or other easy points.
 5. Axis of symmetry is vertical line
determined by $x = x_v$.
Use this to get reflected points.
- [Note that D: all x, and R: $y \geq y_v$ if $a > 0$
or $y \leq y_v$ if $a < 0$]

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3.1 Quadratic Functions

G: $f(x) = -3(x-2)^2 + 12$ F: V

Standard Form:

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

where $a \neq 0$, and (h, k) is vertex

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3.1 Quadratic Functions

G: $f(x) = -3(x-2)^2 + 12$ F: V

Standard Form:

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

where $a \neq 0$, and (h, k) is vertex

$\therefore V(2, 12)$

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3.1 Quadratic Functions

G: $f(x) = 3x^2 - 12x + 1$ F: V

not in standard form

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

Standard Form:

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

where $a \neq 0$, and (h, k) is vertex

$$h = -\frac{b}{2a}$$

$$k = f(h) = f\left(-\frac{b}{2a}\right)$$

Quadratic Formula

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

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3.1 Quadratic Functions

G: $f(x) = 3x^2 - 12x + 1$ F: V

$$h = -\frac{b}{2a}$$

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

$$a = 3$$

$$b = -12$$

$$x_v = \frac{-b}{2a} = \frac{-(-12)}{2(3)}$$

$$x_v = \frac{12}{6} = 2$$

$$k = f(h) = f\left(\frac{-b}{2a}\right)$$

$$f(2) = 3(2)^2 - 12(2) + 1$$

$$f(2) = 3(4) - 24 + 1$$

$$= 12 - 24 + 1 = -12 + 1 = -11$$

$$\therefore V(2, -11)$$

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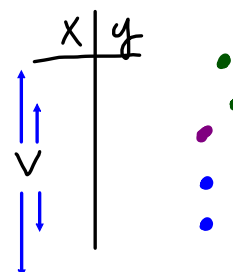
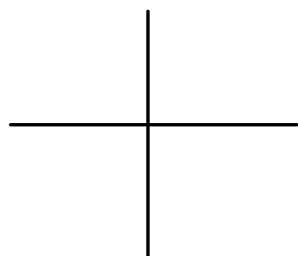
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3.1 Quadratic Functions

G: $f(x) = (x-1)^2 - 2$

F: V, inter. (y)

$V(,)$ opens _____, $a ? 0$



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3.1 Quadratic Functions

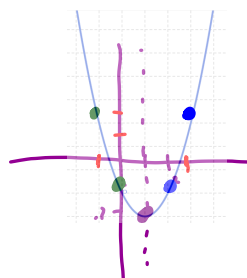
$$G: f(x) = (x-1)^2 - 2 \quad F: V, \text{inter. (y)}$$

$V(1, -2)$ opens up: $a=1 > 0$

$$f(0) = (-1)^2 - 2 = 1 - 2 = -1$$

$$f(-1) = (-1-1)^2 - 2 = (-2)^2 - 2 = 4 - 2 = 2$$

x	y
-1	2
0	-1
1	-2
2	-1
3	2

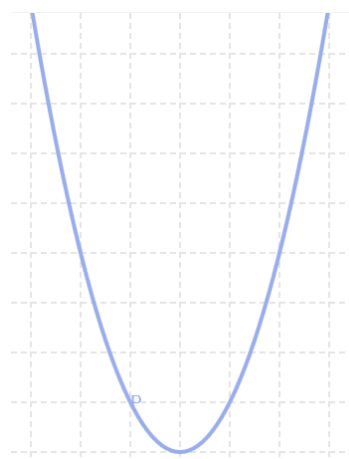
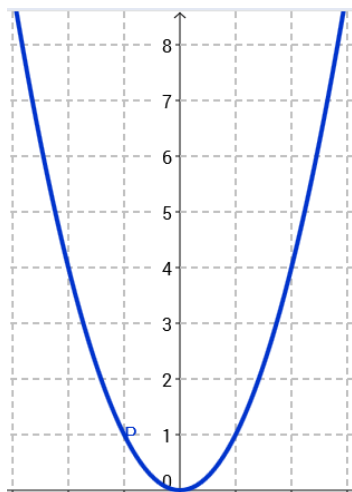


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Attachments

slope_intercept.mp4