

Box method $(x+2)(x-3)$ factored

$+2$	$2x$	-6
x	x^2	$-3x$
	x	-3

$$= x^2 - 3x + 2x - 6$$

$$= x^2 - 1x - 6$$

or expanded

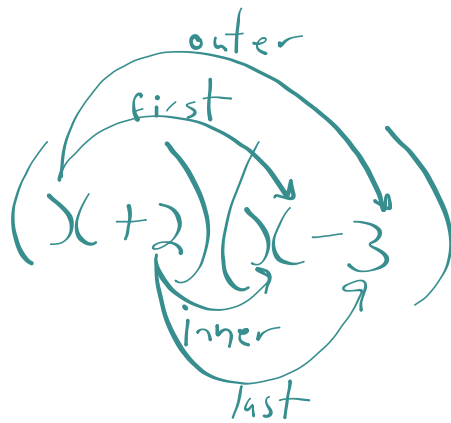
$$= x^2 - x - 6$$

Vertical Method $(x+2)(x-3)$

$$\begin{array}{r} x+2 \\ \times \quad x-3 \\ \hline -3x-6 \\ + \quad x^2+2x \\ \hline x^2-x-6 \end{array}$$

$$\begin{array}{r} 24 \\ \times 13 \\ \hline 72 \\ + 240 \\ \hline 312 \end{array}$$

F.O.I.L. method $(x+2)(x-3)$



$$\begin{aligned} x^2 - 3x + 2x - 6 &= \\ x^2 - 1x - 6 \end{aligned}$$

$$\begin{aligned} & (x+y)(2x-y) \\ & 2x^2 - xy + 2xy - y^2 \\ & 2x^2 + xy - y^2 \end{aligned}$$

Problem 2.5 A Closer Look at Parabolas

These equations, all in factored form, were graphed using the window settings shown at the right. The graphs are shown below.

$$y_1 = x^2$$

$$y_3 = (x + 2)(x + 3)$$

$$y_5 = x(4 - x)$$

$$y_7 = x(x + 4)$$

$$y_2 = 2x(x + 4)$$

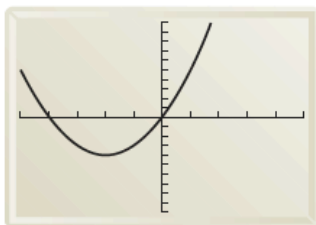
$$y_4 = (x + 3)(x + 3)$$

$$y_6 = x(x - 4)$$

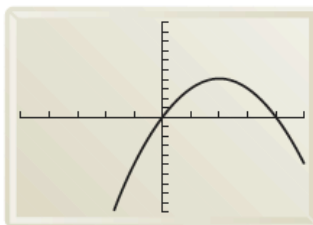
$$y_8 = (x + 3)(x - 3)$$

WINDOW	FORMAT
Xmin=-5	
Xmax=5	
Xscl=1	
Ymin=-10	
Ymax=10	
Yscl=1	
Xres=1	

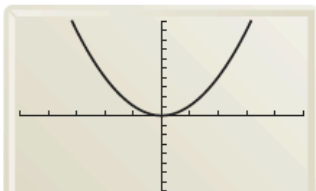
Graph A



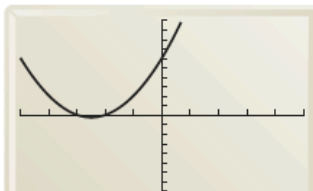
Graph B



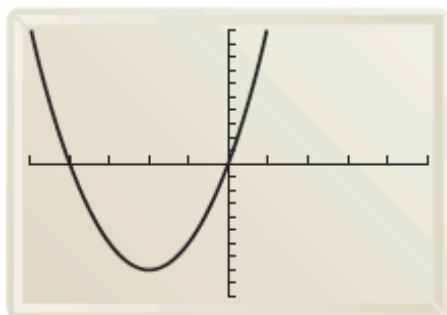
Graph C



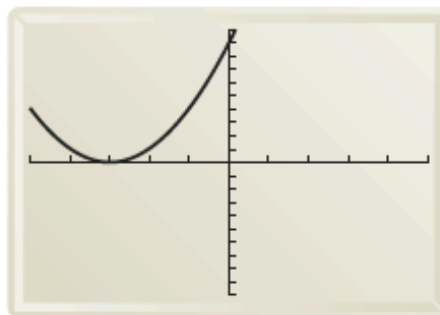
Graph D



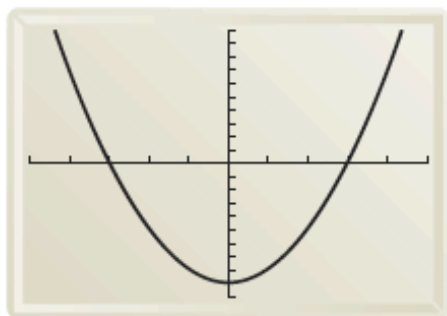
Graph E



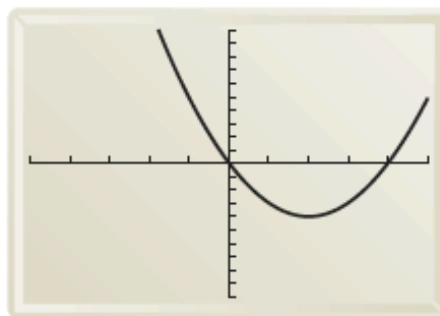
Graph F

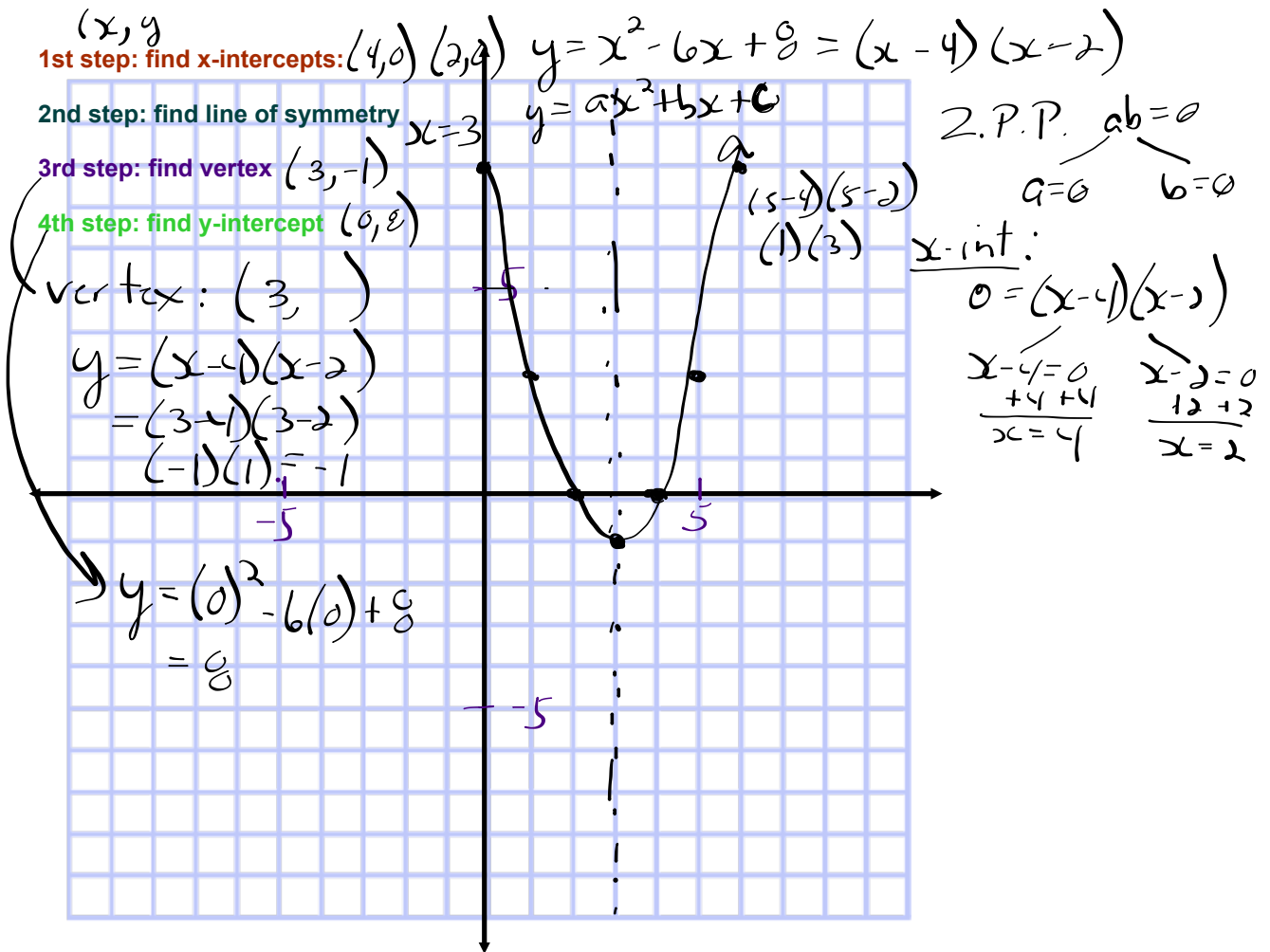


Graph G



Graph H





✓ 1st step: find x-intercepts:

✓ 2nd step: find line of symmetry

✓ 3rd step: find vertex

4th step: find y-intercept

Vertex $y = (-2+5)(-2-1)$
 $= (3)(-3) = -9$

$$y = x^2 + 4x - 5$$

$$y = (-2)^2 + 4(-2) - 5$$

$$y = 4 - 8 - 5 = -9$$

$$(-2, -9)$$

y-int:

$$y = (0+5)(0-1)$$

$$= (5)(-1) = -5$$

$$(0, -5)$$

(x, y)

$$y = (-1+5)(-1-1)$$
$$= (4)(-2) = -8$$
$$(-1, -8)$$

$$y = x^2 + 4x - 5:$$
$$y = (x+5)(x-1)$$

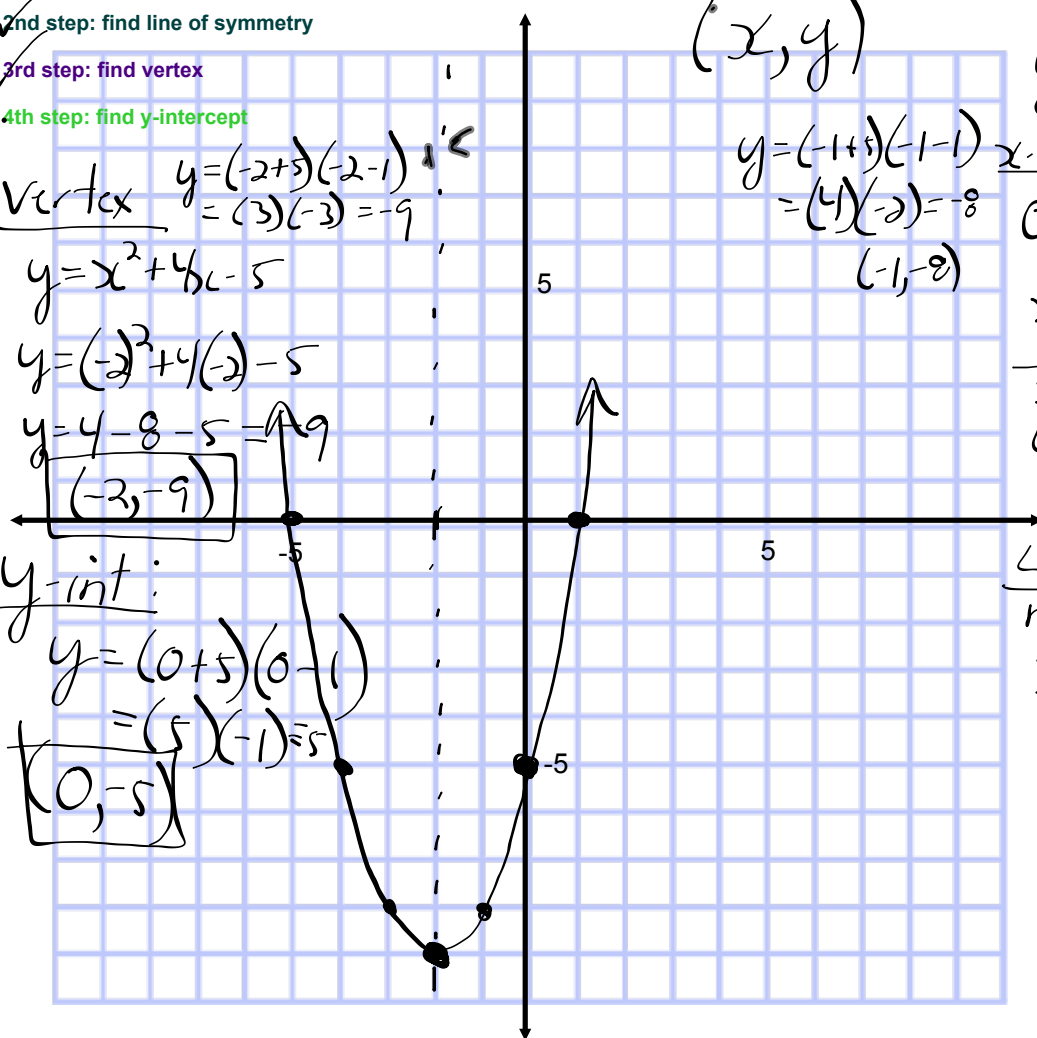
x-int: 2 P.P.

$$0 = (x+5)(x-1)$$

$$\begin{array}{l} x+5=0 \\ -5-5 \\ x=-5 \\ (-5, 0) \end{array} \quad \begin{array}{l} x-1=0 \\ +1+1 \\ x=1 \\ (1, 0) \end{array}$$

L.O.S.

$$\text{midpt of } -5 \text{ \& } 1$$
$$x = -2$$





No worries:)

$$\left(\frac{3}{2}, 0\right)$$

$$\left(-\frac{4}{5}, 0\right)$$

$$y = \underline{a}x^2 + \underline{b}x + \underline{c}$$

positive open up \cup

negative open down \cap

y-int

$$0 = (2x - 3)(5x + 4)$$

$$\begin{array}{l} \swarrow \\ 2x - 3 = 0 \\ +3 \quad +3 \\ \hline 2x = 3 \\ \frac{2x}{2} = \frac{3}{2} \\ \hline x = \frac{3}{2} \end{array}$$

$$\begin{array}{l} \searrow \\ 5x + 4 = 0 \\ -4 \quad -4 \\ \hline 5x = -4 \\ \frac{5x}{5} = \frac{-4}{5} \\ \hline x = -\frac{4}{5} \end{array}$$

Graph	Graph A	Graph B	Graph C	Graph D	Graph E	Graph F	Graph G	Graph H
Equation-Factored Form	$x(x+4)$	$x(4-x)$	x^2	$(x+2)(x+3)$	$2x(x+4)$	$(x+3)^2$	$(x+3)(x-3)$	$x(x-4)$
Equation-Expanded Form	x^2+4x	$4x-x^2$ $-x^2+4x$	x^2	x^2+5x+6	$2x^2+8x$	x^2+6x+9	x^2-9	x^2-4x
x-Intercepts	$(0,0)$ $(-4,0)$	$(0,0)$ $(4,0)$	$(0,0)$	$(-2,0)$ $(-3,0)$	$(0,0)$ $(-4,0)$	$(-3,0)$ $(-3,0)$	$(-3,0)$ $(3,0)$	$(0,0)$ $(4,0)$
y-Intercepts	$(0,0)$	$(0,0)$	$(0,0)$	$(0,6)$	$(0,0)$	$(0,9)$	$(0,-9)$	$(0,0)$
Minimum or Maximum Point	$(-2,-4)$	$(2,4)$	$(0,0)$	$(-2.5, -0.25)$	$(-2,-8)$	$(-3,0)$	$(0,-9)$	$(2,-4)$
Opens Up or Down	up	down	up	up	up	up	up	up
Equation of the Line of Symmetry	$x=-2$	$x=2$	$x=0$	$x=-2.5$	$x=-2$	$x=-3$	$x=0$	$x=2$

- A.** Do parts (1)–(5) for each equation.
1. Match the equation to its graph.
 2. Label the coordinates of the x - and y -intercepts of the graph. Describe how you can predict the x - and y -intercepts from the equation.
 3. Draw the line of symmetry of the graph. Can you predict the location of the line of symmetry from the equation? Explain.
 4. Label the coordinates of the maximum or minimum point. Can you predict the maximum or minimum point from the equation? Explain.
 5. Describe the shape of the graph.
- B.**
1. Write each of the equations in expanded form.
 2. What features of the graph can you predict from the expanded form of the equation? What features can you predict from the factored form? Explain.
- C.** *Without* graphing, describe the graph of each equation. Give as many details as possible.
1. $y = x^2 + 6x + 5$ 2. $y = -x^2 + 4x$ 3. $y = (x - 2)(x + 3)$
- D.** How can you tell whether an equation represents a quadratic relationship if it is in expanded form? If it is in factored form?

ACE Homework starts on page 30.

40. Give the line of symmetry, the x - and y -intercepts, and the maximum or minimum point for the graph of each equation.

a. $y = (x - 3)(x + 3)$

b. $y = x(x + 5)$

c. $y = (x + 3)(x + 5)$

d. $y = (x - 3)(x + 5)$

e. $y = (x + 3)(x - 5)$

For Exercises 41 and 42, complete parts (a)–(e) for each equation.

41. $y = x^2 + 5x + 6$

42. $y = x^2 - 25$

a. Find an equivalent factored form of the equation.

b. Identify the x - and y -intercepts for the graph of the equation.

c. Find the coordinates of the maximum or minimum point.

d. Find the line of symmetry.

e. Tell which form of the equation can be used to predict the features in parts (b)–(d) without making a graph.

- 43.** Darnell makes a rectangle from a square by doubling one dimension and adding 3 centimeters. He leaves the other dimension unchanged.
- a.** Write an equation for the area A of the new rectangle in terms of the side length x of the original square.
 - b.** Graph your area equation.
 - c.** What are the x -intercepts of the graph? How can you find the x -intercepts from the graph? How can you find them from the equation?

For Exercises 44–47, match the equation with its graph. Then, explain how to locate the line of symmetry for the graph.

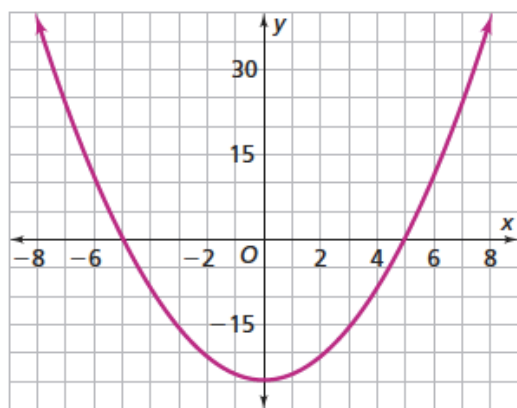
44. $y = (x + 7)(x + 2)$

45. $y = x(x + 3)$

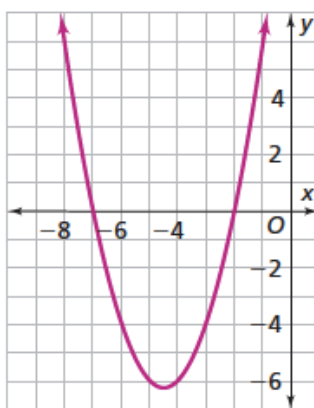
46. $y = (x - 4)(x + 6)$

47. $y = (x - 5)(x + 5)$

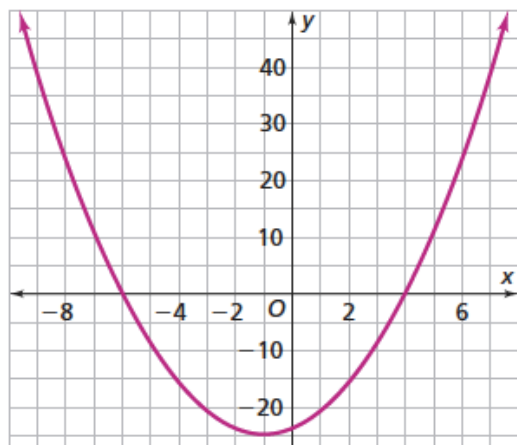
Graph A



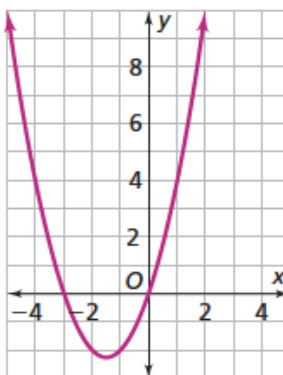
Graph B



Graph C



Graph D

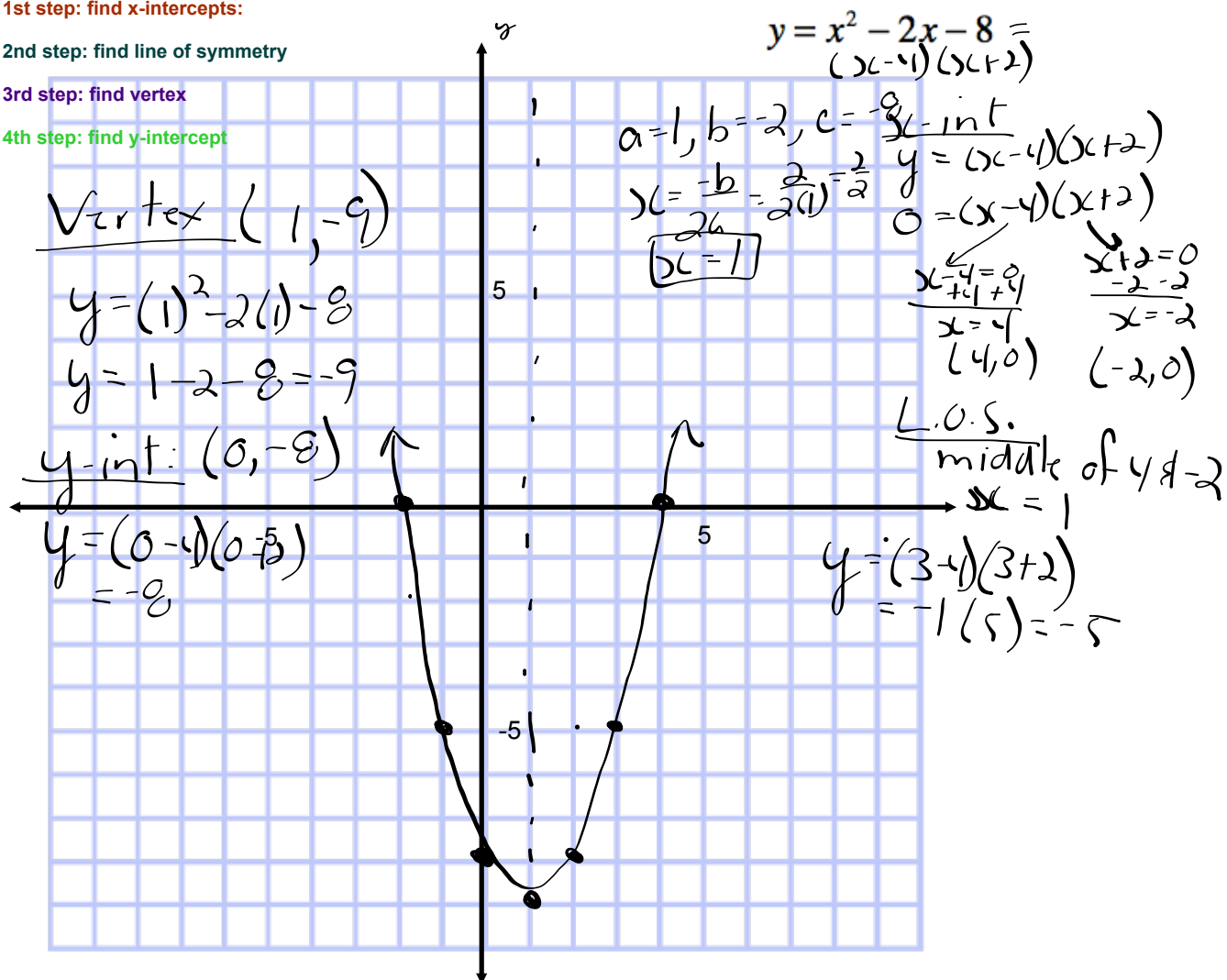


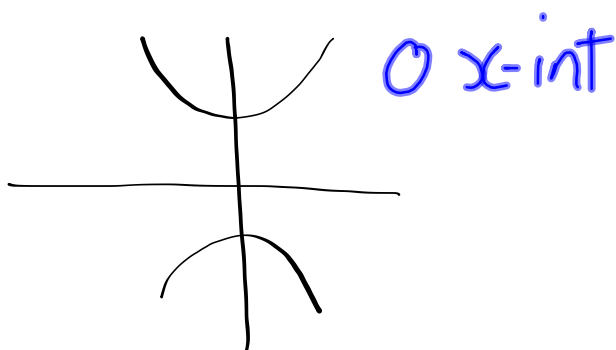
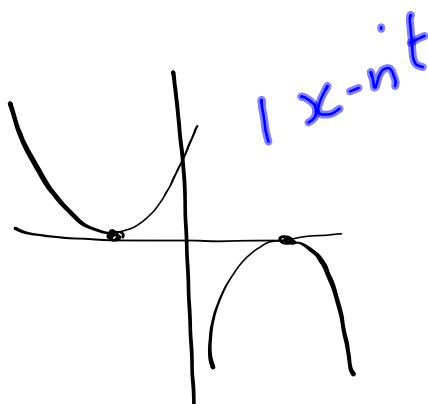
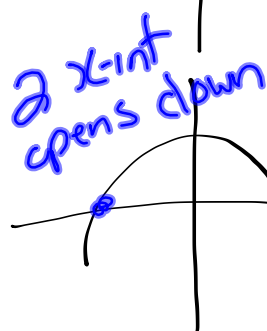
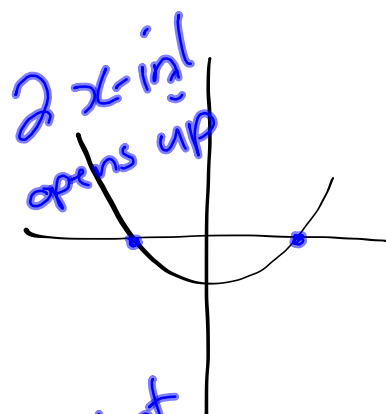
1st step: find x-intercepts:

2nd step: find line of symmetry

3rd step: find vertex

4th step: find y-intercept





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

↙ ↘

+ open U y-int

- opens ∩

65. Sketch graphs of the equations $y = x^2 + 2x$ and $y = x^2 + 2$.

- How are the graphs similar?
- How are the graphs different?
- Find the y-intercept for each graph.
- Find the x-intercepts for each graph if they exist. If there are no x-intercepts, explain why.
- Do all quadratic relationships have y-intercepts? Explain.

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

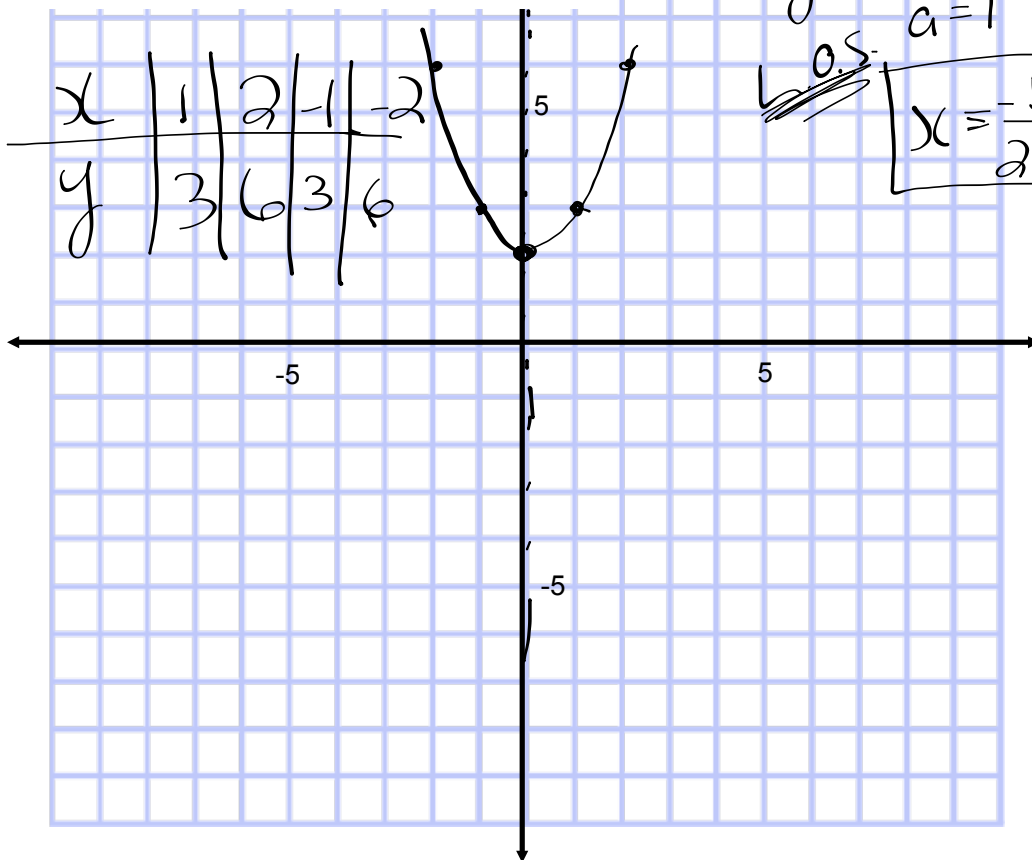
$$y = x^2 + 0x + 2$$

$$a=1 \quad b=0 \quad c=2$$

0.5

$$x = \frac{-b}{2a} = \frac{0}{2(1)} = \frac{0}{2} = 0$$

$$x = 0$$



1st step: find x-intercepts:

2nd step: find line of symmetry

3rd step: find vertex

4th step: find y-intercept

$$y = x^2 - 4x + 3$$

