

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

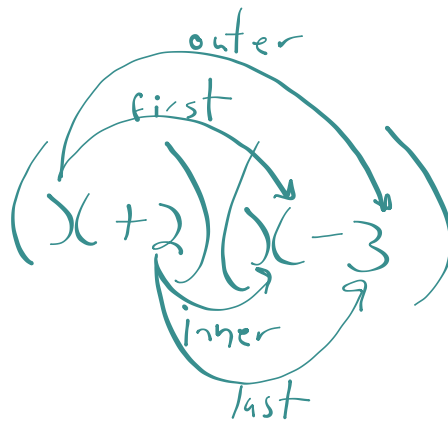
$$= x^2 - x - 6$$

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



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

Handwritten algebraic expansion of the product  $(x+y)(2x-y)$ . The first line shows the factors  $(x+y)(2x-y)$  with curved arrows indicating the distributive process: one arrow from  $x$  to  $2x$  and another from  $x$  to  $-y$ , and a third arrow from  $y$  to  $2x$  and a fourth from  $y$  to  $-y$ . The second line shows the resulting terms:  $2x^2 - xy + 2xy - y^2$ . The third line shows the simplified result,  $2x^2 + xy - y^2$ , which is circled.

$$(x+y)(2x-y)$$
$$2x^2 - xy + 2xy - y^2$$
$$2x^2 + xy - y^2$$

### 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.

$$y_1 = x^2$$

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

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

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

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

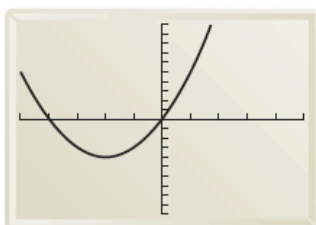
$$y_4 = (x + 3)(x + 3)$$

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

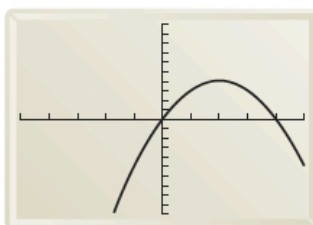
$$y_8 = (x + 3)(x - 3)$$

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

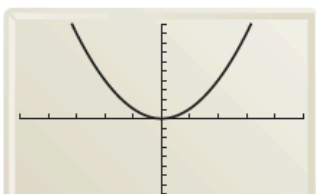
Graph A



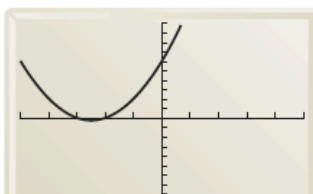
Graph B



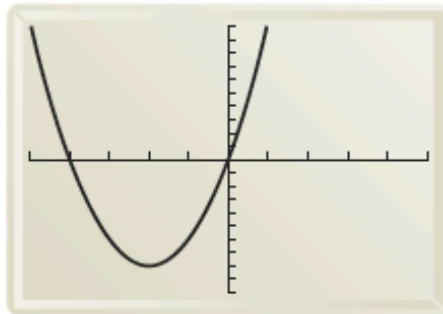
Graph C



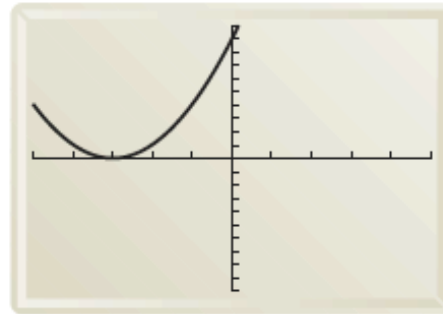
Graph D



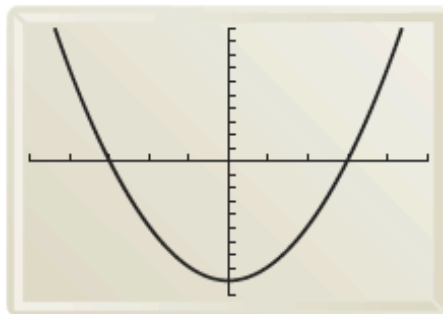
Graph E



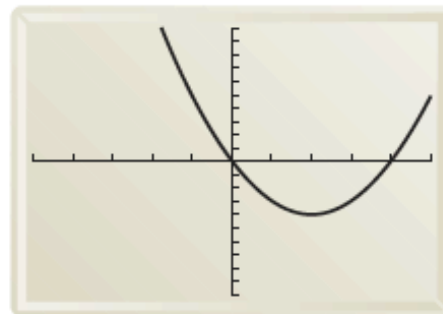
Graph F

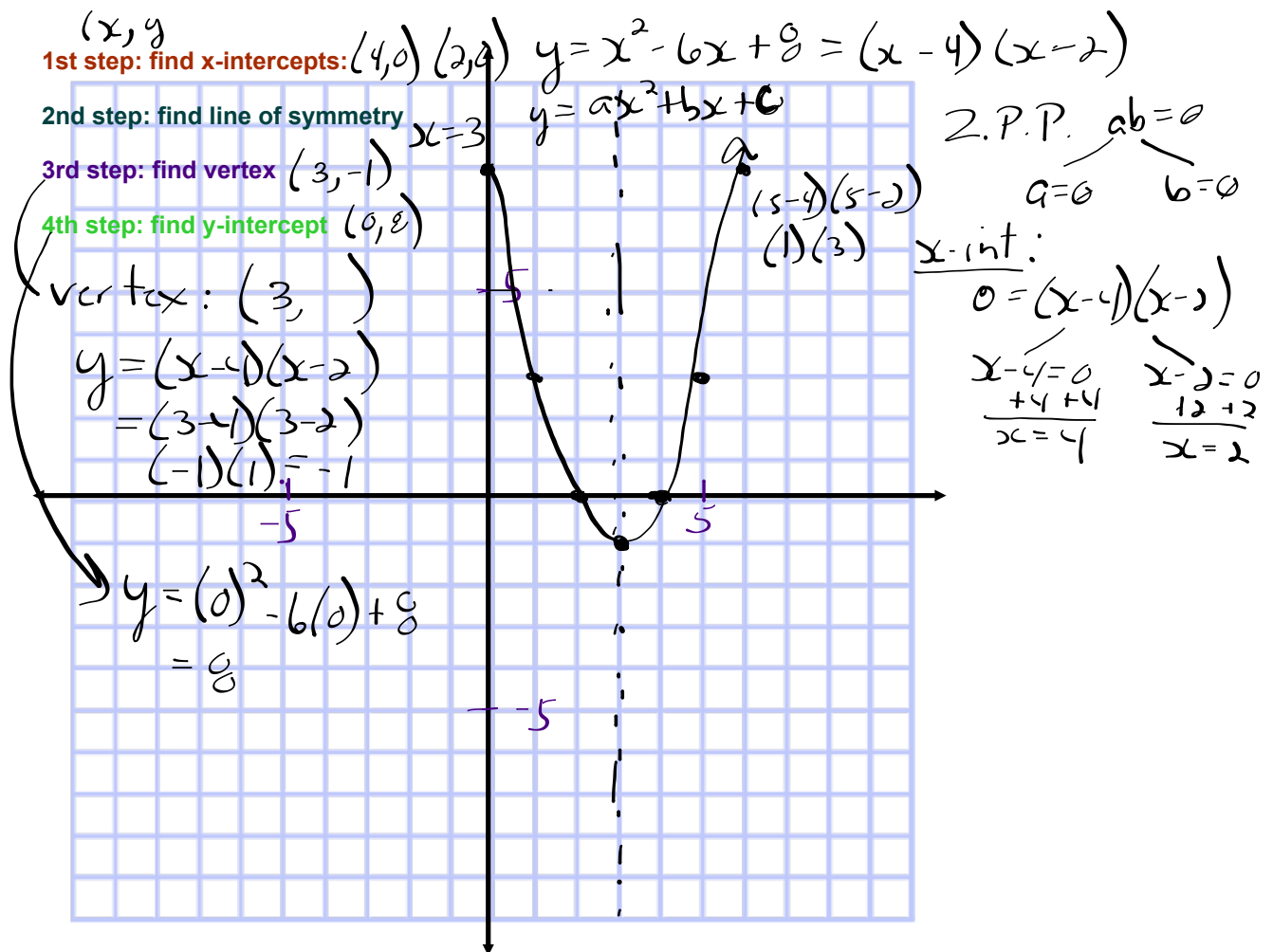


Graph G



Graph H







No worries:)



✓ 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.

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

$$x+5=0$$

$$\frac{-5-5}{x=-5}$$

$$(-5, 0)$$

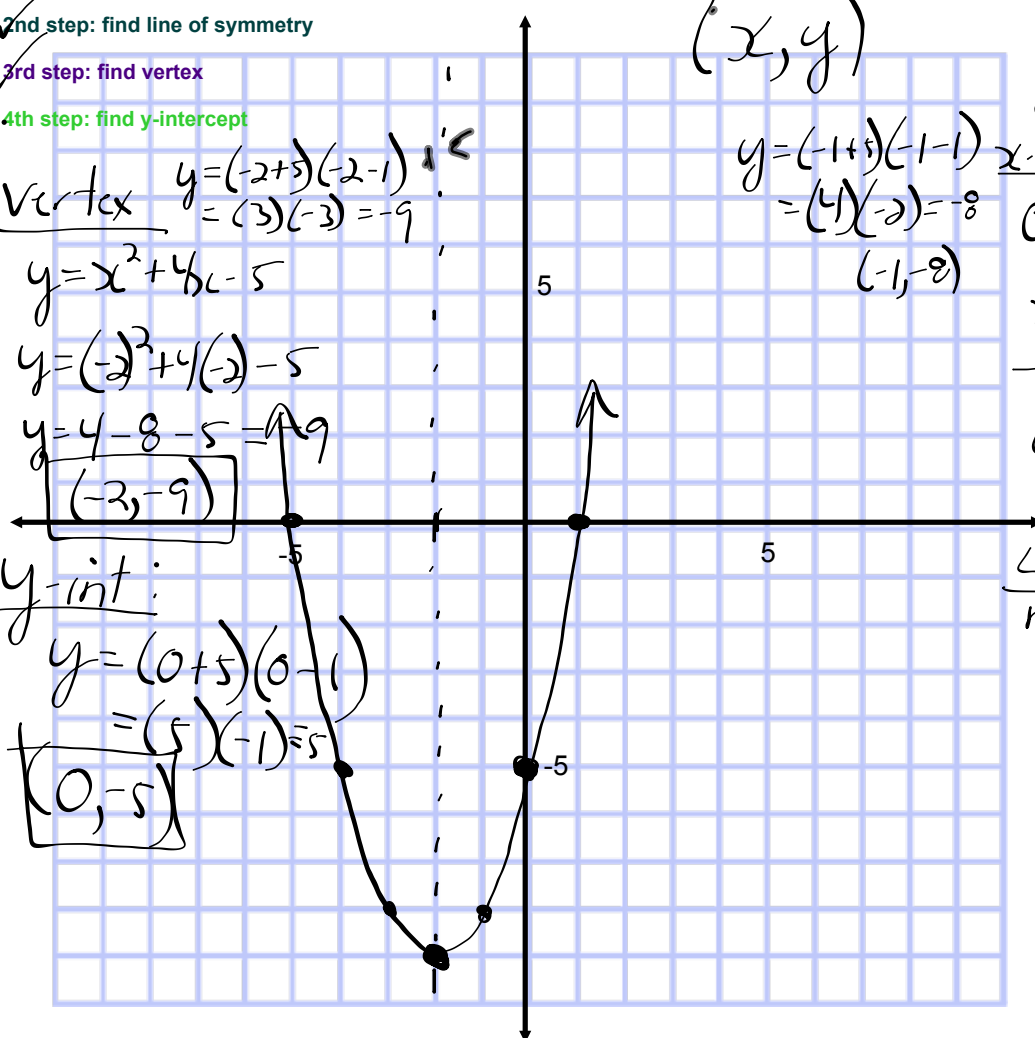
$$x-1=0$$

$$\frac{+1+1}{x=1}$$

$$(1, 0)$$

L.O.S.

midpt of -5 & 1  
 $x = -2$



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

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

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

positive open up  $\cup$

negative open down  $\cap$

y-int

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

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

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

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.  $y = -x^2 + 4x - 5$       3.  $y = \underline{(x - 2)(x + 3)}$
- D.** How can you tell whether an equation represents a quadratic relationship if it is in expanded form? If it is in factored form?



Homework starts on page 30.