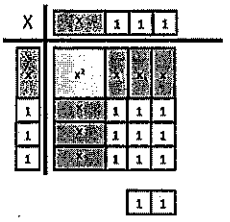
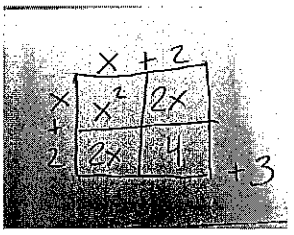
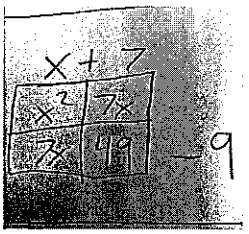
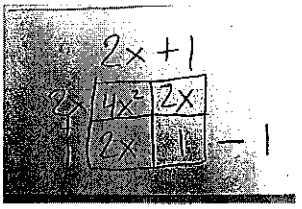
Algebra 2 Name:_____

Day 28: Solving and Graphing with Completing the Square

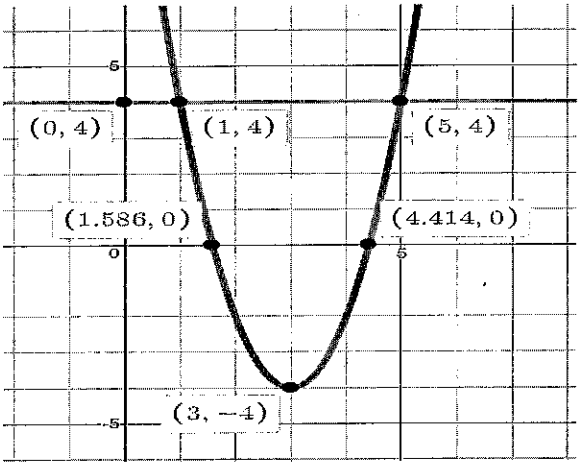
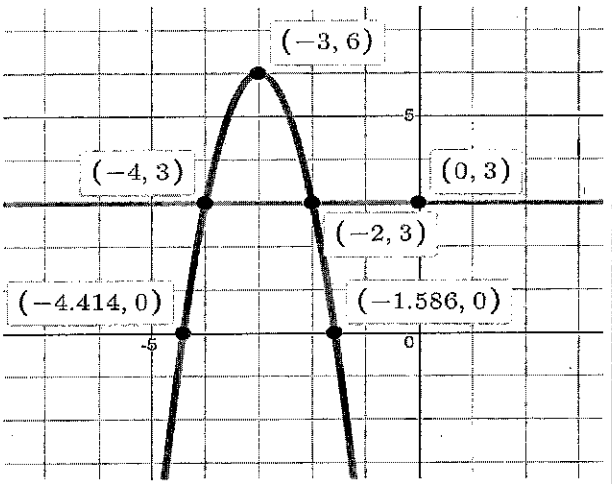
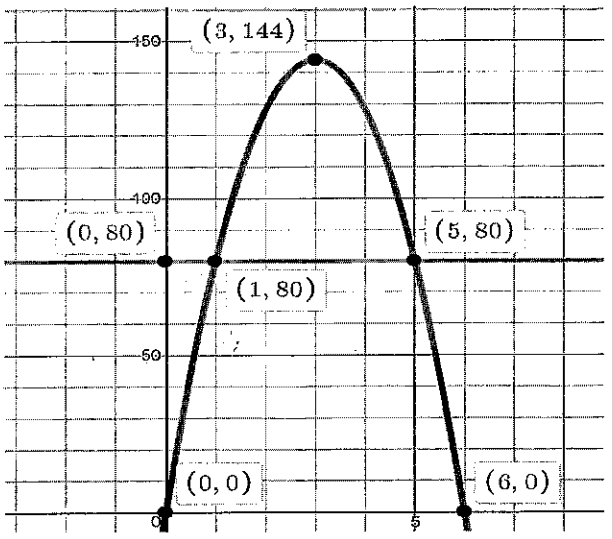
Last class we learned the process for Completing the Square. Here's an example as a reminder:

Step 1: Divide 6x by 2. (You divide by 2 because squares have sides with the same length) Step 2: Calculate 3^2. (You calculate 3 squared because we are literally making a square) Step 3: Subtract 9 from 11. (You subtract 9 because those "fit" inside the square, leaving you with 2 "leftovers") Step 4: Write in vertex form.	Completing the square Write $x^2 + 6x + 11$ in the form $(x + a)^2 + b$  Both factors are the same so you need to share your x terms equally between columns and rows. The remainder 1s left over is the b term. $(x + 3)^2 + 2$

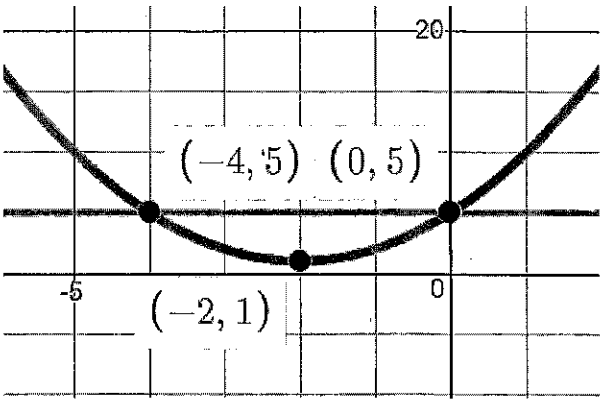
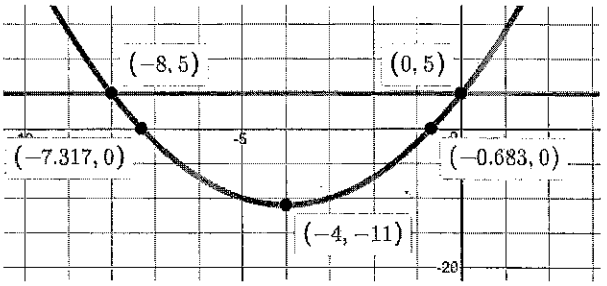
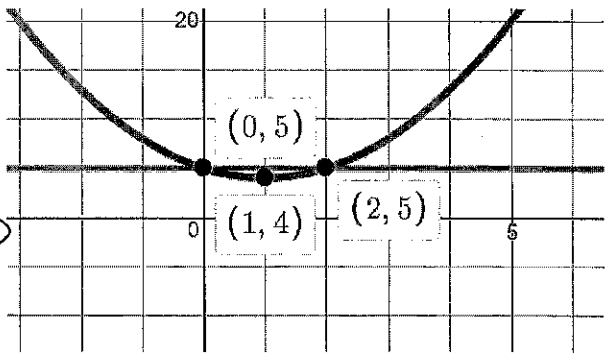
Use the drawings to write each equation in standard form and in vertex form.

Standard Form	Drawing	Vertex Form
$x^2 + 4x + 7$		$(x+2)^2+3$
$x^2+14x+40$		$(x+7)^2-9$
$4x^2+4x$		$(2x+1)^2-1$

We did these problems before in this unit. Try to solve them again. Notice how the equations are all in vertex form.

Equations	Graphs:
$2(x-3)^2-4=4$ $+4\ +4$ $\frac{2(x-3)^2}{2}=\frac{8}{2}$ $\sqrt{(x-3)^2}=\sqrt{4}$ $x-3=2$ $\quad$ $x-3=-2$ $x=5$ $\quad$ $x=1$	
$-3(x+3)^2+6=3$ $-6\ -6$ $\frac{-3(x+3)^2}{-3}=\frac{-3}{-3}$ $\sqrt{(x+3)^2}=\sqrt{1}$ $x+3=1$ $\quad$ $x+3=-1$ $x=-2$ $\quad$ $x=-4$	
$-16(x-3)^2+144=80$ $-144\ -144$ $\frac{-16(x-3)^2}{-16}=\frac{-64}{-16}$ $\sqrt{(x-3)^2}=\sqrt{4}$ $x-3=2$ $\quad$ $x-3=-2$ $x=5$ $\quad$ $x=1$	

Now you will get equations in STANDARD form. First, complete the square to rewrite the equations in VERTEX form. Then, solve for x. Check with the graphs.

Equations	Graphs:
$x^2 + 4x + 5 = 5$ $(x+2)^2 + 1 = 5$ $-1 \quad -1$ $(x+2)^2 = 4$ $x+2=2 \quad x+2=-2$ $x=0 \quad x=-4$	
$x^2 + 8x + 5 = 5$ $(x+4)^2 - 11 = 5$ $+11 \quad +11$ $(x+4)^2 = 16$ $x+4=4 \quad x+4=-4$ $x=0 \quad x=-8$	
$x^2 - 2x + 5 = 5$ $(x-1)^2 + 4 = 5$ $(x-1)^2 = 1$ $x-1=1 \quad x-1=-1$ $x=2 \quad x=0$	

Reflect:

1. **What part of the graph does STANDARD form tell you?**

   y-int

2. **What part of the graph does VERTEX form tell you? (Don't overthink it)**

   Vertex

3. **What part(s) of the graph are the SOLUTIONS to the equation?**

   x-coordinate of P.O.I.

Mixed Practice: Solve each equation below by completing the square. Check your answers by graphing.

1. $x^2 + 8x + 14 = 14$

$(x+4)^2 - 2 = 14$

$(x+4)^2 = 16$

$x+4=4$ $\quad x=0$

$x+4=-4$ $\quad x=-8$

2. $x^2 - 8x + 14 = 14$

$(x-4)^2 - 2 = 14$

$(x-4)^2 = 16$

$x-4=4$ $\quad x=8$

$x-4=-4$ $\quad x=0$

3. $x^2 + 8x + 14 = -2$

$(x+4)^2 - 2 = -2$

$(x+4)^2 = 0$

$x=-4$

4. $x^2 + 8x + 14 = -14$

$(x+4)^2 - 2 = -14$

$(x+4)^2 = -16$ No Sol

5. **Can you explain why you got different numbers of solutions in those problems? Use your graphs to help explain.**

Can't square not a negative #.

OR

Graphs can intersect twice, once, or not at all.

2 1 None