7.6 Completing the Square

Warm-Up Wednesday

1. Describe in words the transformations from the parent function:

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

- reflects
- narrower by 2
- right 3

About Me

1. How many times do you usually hit snooze in the morning?

2. Would you rather get up early or stay up late?

questions??

7.4 Graphs Squares and Absolute Value Transformations
Name:_____

Describe *in words* how the parent graph, $f(x)=x^2$, is transformed into g(x).

1. $g(x)=2.8(x+16)^2+10$

2. $g(x)=-\frac{3}{10}(x-11)^2+6$

Describe *in words* how the parent graph, $f(x)=|x|$, is transformed into g(x).

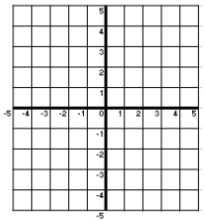
3. $g(x)=7|x+2|-5$

4. $g(x)=-\frac{1}{8}|x-3|+4$

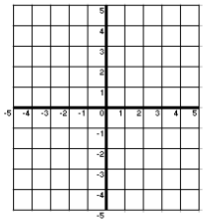
5. $g(x)=-|x+6|+7$

#6-8 Sketch the graph of the function. Label each vertex.

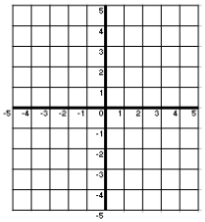
6. $f(x)=\frac{1}{5}(x+2)^2-4$



7. $g(x)=3(x+1)^2-2$



8. $h(x)=-|x+2|+1$



9. Based on the description, write the equation in the form of $y = a \cdot f(x-c) + d$ for the parent graph, $f(x) = |x|$.

a.) The graph is reflected over the x-axis, widened by a factor of $\frac{1}{2}$, and translated 3 units to the right.

b.) The graph is narrowed by a factor of 3, translated 4 units to the left, and 8 units down.

10. Record the letters in order from narrowest graph to the widest.

$A.\ y = -2f(x)$ $B.\ y = \frac{1}{2}f(x)$ $C.\ y = 5f(x)$ $D.\ y = \frac{8}{3}f(x)$ $E.\ y = -\frac{1}{3}f(x)$

Describe *in words* how the parent graph, $f(x) = x^2$, is transformed into g(x).

11. $g(x) = \frac{1}{5}(x-1)^2 + 3$

12. $g(x) = -7(x-11)^2 + 2$

Describe *in words* how the parent graph, $f(x) = |x|$, is transformed into g(x).

13. $g(x) = \frac{1}{2}|x+4| - 9$

14. $g(x) = -5|x-3| + 4$

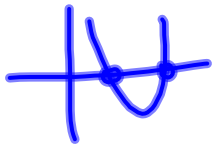
15. $g(x) = 2|x| - 7$

7.6 Completing the Square

EQ: How do I convert quadratic equations into vertex form?

DISCRIMINANT

$b^2 - 4ac$



$b^2-4ac > 0$ (positive) TWO SOL'NS

$b^2-4ac = 0$ ONE SOLUTION

$b^2-4ac < 0$ (negative) NO SOL'N

Example 1: How many real solutions are there for each function?

$y=ax^2+bx+c$

a) $y = x^2 - 3x + 3$

$a=1 \quad b=-3 \quad c=3$

b^2-4ac

$(-3)^2-4(1)(3)$

$9-12 < 0$

$\boxed{\text{NO SOL'N}}$

b) $y = 2x^2 + 2x - 5$

$a=2 \quad b=2 \quad c=-5$

$(2)^2-4(2)(-5)$

$4+8(5) > 0$

$\boxed{\text{TWO SOL'NS}}$

7.6 Completing the Square

EQ: **How do I convert quadratic equations into vertex form?**

Vertex Form of a Parabola

Horizontal Shift

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

Vertical Shift

Skinnier if… a>1
Wider if… 0<a<1

Opens Up if… a is positive / Opens Down if… a is negative

Vertex: (h,k) Axis of symmetry x=h

ex.
$f(x) = (x-4)^2 + 3$

Vertex: (4,3)
AoS: x=4

7.6 Completing the Square

EQ: How do I convert quadratic equations into vertex form?

Example 2: Complete the square for each function in order to find the vertex and the line of symmetry.

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

a) $y = x^2 - 4x + 9$

$0 = x^2 - 4x + 9$
$-9 \qquad -9$

① Plug in y=0
② move constants
③ Add $\left(\frac{b}{2}\right)^2$ to both sides
④ Factor
⑤ write as square
⑥ move constant back

$4 + -9 = x^2 - 4x + \left(\frac{-4}{2}\right)^2$

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

$-2 \times -2 = 4$, $-2 + -2 = -4$

$(x-2)(x-2)$

$-5 = (x-2)^2$
$+5 \qquad +5$

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

vertex: $(2, 5)$
A.o.S. $x = 2$

7.6 Completing the Square

EQ: How do I convert quadratic equations into vertex form?

b. $y = -2x^2 - 12x - 13$

$0 = -2x^2 - 12x - 13$
$+13 \qquad\qquad +13$

$13 = -2x^2 - 12x$

* Factor out a if $a \neq 1$

$(-2)(9) + 13 = -2\left(x^2 + 6x + \left(\frac{6}{2}\right)^2\right)$

$-5 = -2(x^2 + 6x + 9)$

9: $3, 3$; 6

$(x+3)(x+3)$

$-5 = -2(x+3)^2$
$+5 \qquad\qquad +5$

$y = -2(x+3)^2 + 5$

Vertex $(-3, 5)$

A.o.S $x = -3$

7.5 Completing the Square & Discriminants Name _____
Pre Cal

In 1-4, complete the square for each function. Then write a sequence of transformations that will produce its graph from the graph of $y = x^2$. In each case, find the vertex and the line of symmetry of the parabola.

1. $f(x) = x^2 - 4x + 6$

2. $f(x) = x^2 - 6x + 12$

3. $f(x) = 2x^2 - 8x + 20$

4. $f(x) = 10 - 16x - x^2$

In 5-10, use the discriminant to determine how many real-number zeroes each quadratic function has.

5. $f(x) = 2x^2 + 5x + 1$

6. $f(x) = x^2 - 2x + 1$

7. $f(x) = x^2 + x + 1$

8. $f(x) = 2x^2 - 4x + 1$

9. $f(x) = 3x^2 - 7x - 3$

10. $f(x) = 2x^2 - x + 3$

7.6 Completing the Square

EQ: How do I convert quadratic equations into vertex form?

~~Exit Ticket~~

on google classroom