7.7 Completing the Square

Warm-Up Wednesday (notecard)

How many solutions (zeros) do the following equations have?

① $f(x)=3x^2-5x+1$

$a=3 \quad b=-5 \quad c=1$

$(-5)^2-4(3)(1)$

$25-12$

$13>0$

$\boxed{\text{TWO solutions}}$

② $y=x^2+3x+6$

About Me

1. Falcons or Patriots?

2. SAT or ACT?

7.7 Completing the Square

DISCRIMINANT

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

$$\boxed{b^2 - 4ac}$$

POSITIVE $b^2-4ac > 0$	TWO real solutions
ZERO $b^2-4ac = 0$	ONE real solution
NEGATIVE $b^2-4ac < 0$	NO real solutions

7.7 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. $(x-h)^2 + k$

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

Vertex: $(4, 3)$

AoS: $x = 4$

7.7 Completing the Square

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

Example1: Complete the square for each function in order to find the vertex and the line of symmetry.

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

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

$b = -4$

$(-\frac{4}{2})^2 = (-2)^2$

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

Vertex: $(2,5)$

LoS: $x = 2$

① Find b

$(\frac{b}{2})^2$

② Add $(\frac{b}{2})^2$

③ Subtract from outside

④ Factor parenthesis

$(x \pm \frac{b}{2})^2$

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

$y = -2(x^2 + 6x + 9) - 13 + 18$

$-18 \quad +18$

$(\frac{6}{2})^2 = (3)^2 = 9$

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

Vertex: $(-3,5)$

LoS: $x = -3$

7.7 Completing the Square

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

c) $y = 6x + 11 + x^2$

d) $f(x) = 10 - 16x - x^2$

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

$f(x) = -x^2 - 16x + 10$

$-(x^2 + 16x + \_) + 10$

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