Name: _____ Date: _____ Hour: ____Alg 1____

Unit 7B Day 24: Completing the Square to make Vertex form

Focus Question: How do I complete the square?

A. Review

1. Write the square that created each of the following perfect square trinomials.

a. $x^2 + 30x + 225$ a=1 or 1^2 c=225 or 15^2 $(x+15)^2$

b. $x^2 - 14x + 49$ a=1 or 1^2 c=49 or $(-7)^2$ $(x-7)^2$

c. $4x^2 - 20x + 25$ a=4 or 2^2 c=25 or $(-5)^2$ $(2x-5)^2$

2. Fill in each blank to turn each binomial into a perfect square trinomial. Then write the binomial that was squared.

a. $x^2 - 12x +$ 36 $(x-6)^2$ a=1 or 1^2 b=-12 $\frac{b}{2a}$ $\frac{-12}{2(1)}$ c=36 or $(-6)^2$

b. $x^2 + 40x +$ 400 $(x+20)^2$ a=1 or 1^2 b=40 c=20^2 or 400 $\frac{40}{2(1)} = 20$

*c. $4x^2 + 48x +$ 144 $(2x+12)^2$ a=4 or 2^2 b=48 c=12^2 or 144 $\frac{48}{2(2)}$

3. If you are adding a value to the expression or equation, what must you remember to do so that you are not changing the value of the function?

$f(x) = ax^2 + bx + c +$ # $-$ #

$+5 \quad -5$

B. We now know enough to turn simple standard form quadratics (a=1 and b is even) into vertex form by completing the square!

1) $f(x) = x^2 - 28x - 4$

a=1 or 1^2 b=-28 $\frac{-28}{2(1)}$ c=$(-14)^2$ or 196

$= x^2 - 28x + 196 - 4 - 196$

$f(x) = (x-14)^2 - 200$

2) $g(x) = x^2 + 4x - 23$

a=1 or 1^2 b=4 $\frac{4}{2(1)}$ c=2^2 or 4

$= x^2 + 4x + 4 - 23 - 4$

$g(x) = (x+2)^2 - 27$

3) $h(x) = x^2 - 12x + 16$

$= x^2 - 12x + 36 + 16 - 36$

$h(x) = (x-6)^2 - 20$

a=1 or 1^2 $\frac{-12}{2(1)}$ b=-12 c=$(-6)^2$ or 36

4) $j(x) = x^2 + 2x + 16$

$= x^2 + 2x + 1 + 16 - 1$

$j(x) = (x+1)^2 + 15$

a=1 or 1^2 $\frac{2}{2(1)}$ b=2 c=1^2 or 1

5) $p(x) = x^2 - 6x + 1$

$a=1$ or 1^2

$b=-6$

$x^2-6x+9+1-9$

$(x-3)^2-8$

$c=(-3)^2$ or 9

6) $m(x) = x^2 - 10x + 45$

$x^2-10x+25+45-25$

$m(x-5)^2+20$

$a=1$ or 1^2

$b=-10$

$\frac{-10}{2(1)}$

$c=(-5)^2$ or 25

C. Completing the Square a≠1 or b is odd

Turn the following standard form quadratics into vertex form.

1) $f(x) = 2x^2 + 8x - 9$

$=2x^2+8x \quad -9$

$a=1$ or 1^2

$b=4$

$\frac{4}{2(1)}$

$c=2^2$ or 4

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

$=2(x+2)^2-9-8$

$=2(x+2)^2-17$

2) $g(x) = x^2 + 7x + 2$

$a=1$ or 1^2

$b=7$

$x^2+7x+\frac{49}{4}+2-\frac{49}{4}$

$(x+\frac{7}{2})^2+\frac{8}{4}-\frac{49}{4}$

$(x+\frac{7}{2})^2-\frac{41}{4}$

$\frac{7}{2(1)}$

$c=(\frac{7}{2})^2$ or $\frac{49}{4}$

3) $k(x) = -\frac{1}{4}x^2 - 3x + 6$

$=-\frac{1}{4}x^2-3x \quad +6$

$a=1$ or 1^2

$b=12$

$\frac{12}{2(1)}$

$c=6^2$ or 36

$=-\frac{1}{4}(x^2+12x+36)+6+\frac{1}{4}(36)$

$=-\frac{1}{4}(x+6)^2+6+(9)$

$=-\frac{1}{4}(x+6)^2+15$

4) $h(t) = t^2 - 3t + 2$

$t^2-3t+\frac{9}{4}+2-\frac{9}{4}$

$(x-\frac{3}{2})^2+\frac{8}{4}-\frac{9}{4}$

$(x-\frac{3}{2})^2-\frac{1}{4}$

$a=1$ or 1^2

$b=-3$

$\frac{-3}{2(1)}$

$c=(-\frac{3}{2})^2$ or $\frac{9}{4}$

5) $n(w) = -6w^2 - 36w + 40$

$=-6w^2-36w \quad +40$

$a=1$ or 1^2

$b=6$

$\frac{6}{2(1)}$

$c=3^2$ or 9

$=-6(w^2+6w+9)+40+(6)(9)$

$=-6(w+3)^2+40+54$

$=-6(w+3)^2+94$

6) $r(x) = x^2 + 3x - 10$

$x^2+3x+\frac{9}{4}-10-\frac{9}{4}$

$(x+\frac{3}{2})^2-\frac{40}{4}-\frac{9}{4}$

$(x+\frac{3}{2})^2-\frac{49}{4}$

$a=1$ or 1^2

$b=3$

$\frac{3}{2(1)}$

$c=(\frac{3}{2})^2$ or $\frac{9}{4}$