12/6/12 **Graphing $f(x) = ax^2 + bx + c$**

Note: If a is ⊕, then the parabola opens up. If a is ⊖, then the parabola opens down.

Get the function into $y - K = a(x-h)^2$ form

Ex

1. Replace f(x) w/ y
2. Divide all by "a"
3. Complete the square
4. Mult by "a"
5. get $y-K=a(x-h)^2$

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

$\frac{y}{4} = \frac{4x^2}{4} - \frac{8x}{4} + \frac{2}{4}$

$\frac{y}{4} = x^2 - 4x + \frac{1}{2}$

$4\left(\frac{y}{4} = (x-2)^2 - 4 + \frac{1}{2}\right)$

$y = 4(x-2)^2 - 16 + 2$

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

$+14 \qquad +14$

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

2 $g(x) = 2x^2 + 8x - 3$

$\frac{y}{2} = \frac{2x^2}{2} + \frac{8x}{2} - \frac{3}{2}$

$\frac{y}{2} = x^2 + 4x - \frac{3}{2}$

$2\left(\frac{y}{2} = (x+2)^2 - 4 - \frac{3}{2}\right)$

$y = 2(x+2)^2 - 8 - 3$

$y = 2(x+2)^2 - 11$

$+11 \qquad +11$

$y + 11 = 2(x+2)^2$

3 $f(x) = 3x^2 - 12x + 8$

$\frac{y}{3} = \frac{3x^2}{3} - \frac{12x}{3} + \frac{8}{3}$

$\frac{y}{3} = x^2 - 4x + \frac{8}{3}$

$3\left(\frac{y}{3} = (x-2)^2 - 4 + \frac{8}{3}\right)$

$y = 3(x-2)^2 - 12 + 8$

$y = 3(x-2)^2 - 4$

$+4 \qquad +4$

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

4 $h(x) = 2x^2 + 4x - 6$

$\frac{y}{2} = \frac{2x^2}{2} + \frac{4x}{2} - \frac{6}{2}$

$\frac{y}{2} = x^2 + 2x - 3$

$\frac{y}{2} = (x+1)^2 - 1 - 3$

$2\left(\frac{y}{2} = (x+1)^2 - 4\right)$

$y = 2(x+1)^2 - 8$

$+8 \qquad +8$

$y + 8 = 2(x+1)^2$

5 $f(x) = -x^2 + 4x - 5$

$\frac{y}{-1} = \frac{-x^2}{-1} + \frac{4x}{-1} - \frac{5}{-1}$

$\frac{y}{-1} = x^2 - 4x + 5$

$-1\left(\frac{y}{-1} = (x-2)^2 - 4 + 5\right)$

$y = -(x-2)^2 + 4 - 5$

$y = -(x-2)^2 - 1$

$+1 \qquad +1$

$y + 1 = -(x-2)^2$

Note: The maximum or minimum value of a quadratic is just the y coordinate of the vertex.