Goal: to convert a polynomial like **y = ax2+bx+c** to the form **y-k = a(x-h)2** which has vertex(h,k).

Example 1: Convert y= 5x2-6x-3 to vertex form.

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|  | **Step** | **Why and What** |
| 1 | y= 5x2-6x-3 | Given |
| 2 | y = 5x2-6x -3 | Move the constant term far to the RHS |
| 3 | y = 5[ x2- x ] -3 | Factor the coefficient of x2 from the 1st 2 terms of the RHS. Use “BIG PARENTHESES, or ‘[ ]’ . |
| 4 | y = 5[ x2 - x + ( )2 – ()2 ] - 3 | Complete the square INSIDE the “[ ]”.   1. Half of = = 2. Square the result. Add and subtract it inside the “[ ]”. You have added ZERO to the RHS. |
| 5 | y = 5[( x– )2 – ()2 ] - 3 | Replace the first 3 terms inside the “[ ]” by the square of a binomial. |
| 6 | y = 5(x– )2 – 5 ()2 - 3 | Distribute the coefficient (5) to the two terms inside the “[ ]”. |
| 7 | y = 5(x– )2 - - = 5(x– )2 - | Simplify the term on the right. |
| 8 | y + = 5(x - )2 | Move the constant term on the right to the LHS. |
| 9 | y - - = 5(x– )2 ***= ANSWER*** | Rewrite in vertex form (need “-“ signs). |
| 10 | Vertex = ( - . Steepness = 5. | Find the vertex and the steepness |

Example 2: Convert y= ax2 + bx + c to vertex form.

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|  | **Step** | **Why and What** |
| 1 | y= ax2+bx+c | Given |
| 2 | y = ax2+bx + c | Move the constant term far to the RHS |
| 3 | y = a[ x2- x ] + c | Factor the coefficient of x2 from the 1st 2 terms of the RHS. Use “BIG PARENTHESES, or ‘[ ]’ . |
| 4 | y = a[ x2 - x + ()2 – ()2 ] + c | Complete the square INSIDE the “[ ]”.   1. Half of = 2. Square the result. Add and subtract it inside the “[ ]”. You have added ZERO to the RHS. |
| 5 | y = a[( x- )2 – ()2 ] + c | Replace the first 3 terms inside the “[ ]” by the square of a binomial. |
| 6 | y = a(x- )2 – a ()2 + c | Distribute the coefficient (5) to the two terms inside the “[ ]” |
| 7 | y = a(x- )2 – +  y = a(x- )2 – | Simplify the term on the right. |
| 8 | y + = a(x- )2 | Move the constant term on the right to the LHS. |
| 9 | y - - = a(x- )2 ***= ANSWER*** | Rewrite in vertex form (need “-“ signs). |
| 10 | Vertex = (- , -  Steepness = a. | Find the vertex and the steepness |