Vertex form (sec. 3.1)

$y = a(x-p)^2 + q$

vertex $\Rightarrow (p, q)$

vertical stretch $= a$

axis $\Rightarrow x = p$

range $\Rightarrow y \geq q$, no reflection

$y \leq q$, reflection

* y-intercept is not clear.
  Solve by letting $x = 0$.

Standard Form (3.2)

$y = ax^2 + bx + c$

vertical stretch $= a$

y-intercept $(0, c)$

* vertex is not easily seen.
  Solve for $p \Rightarrow \frac{-b}{2a}$

  Sub that in to get 'q'.

Example: For each of the following, determine the vertex, axis of symmetry, range, y-intercept and vertical stretch

a) $y = -2(x+4)^2 - 7$

vertex $(-4, -7)$

axis $x = -4$

range $\{y \mid y \leq -7, y \in R\}$

v.s $= 2$

y-int (let $x=0$)

$y = -2(0+4)^2 - 7$
$= -2(16) - 7$
$= -32 - 7$
$= -39$

b) $y = -3x^2 + 12x - 4$

y-int: $(0, -4)$

v.s: 3

Determine the vertex $-b/2a$

$\frac{-12}{2(-3)} = \frac{-12}{-6} = 2$ ← x-coordinate of the vertex

$y = -3(2)^2 + 12(2) - 4$
$= -3(4) + 24 - 4$
$= -12 + 24 - 4$
$= 8$

vertex $(2, 8)$
axis of symmetry $x = 2$
range: $\{y \mid y \leq 8, y \in R\}$

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