Graphing $y = a(x-h)^2 + k$ aka Vertex Form

$V(h, k)$. take the number

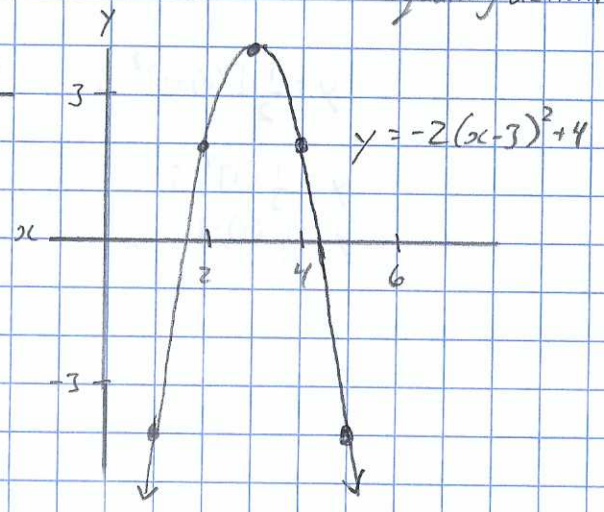
take opposite number

Ex₁ a) Graph the function $y = -2(x-3)^2 + 4$

Sol'n Note: Everything inside these brackets is x related aka horizontal activity aka inside the squaring action.

Steps:
1. Plot vertex ✓ $V(3,4)$
2. Select 2 (or more) x-values to one side of the vertex. Substitute + Solve.
3. Use symmetry to graph other arm ✓ Sym

x	$y = -2(x-3)^2 + 4$
2 ✓	2
1	-4



b) Identify the following:

Direction of Opening: Down ✓

Axis of Symmetry: $x = 3$ ✓

Min/Max Value: ✓ Max value of $y = 4$

Domain: ✓ $\{x \in \mathbb{R}\}$ aka {all x}

Range: ✓ $\{y \in \mathbb{R}, y \leq 4\}$ aka {all y, and y less than or equals 4}

Ex₂ Consider the quadratic function $y = \frac{1}{2}(x+1)^2 - 3$.

a) Write a sentence comparing this graph to the base function $y = x^2$.

Sol'n This new function has been vertically stretched by factor $\frac{1}{2}$ to produce a wider result, horizontally shifted LEFT one unit, and vertically shifted aka slid down 3 units.

b) Graph the function

"take opposite number in brackets"

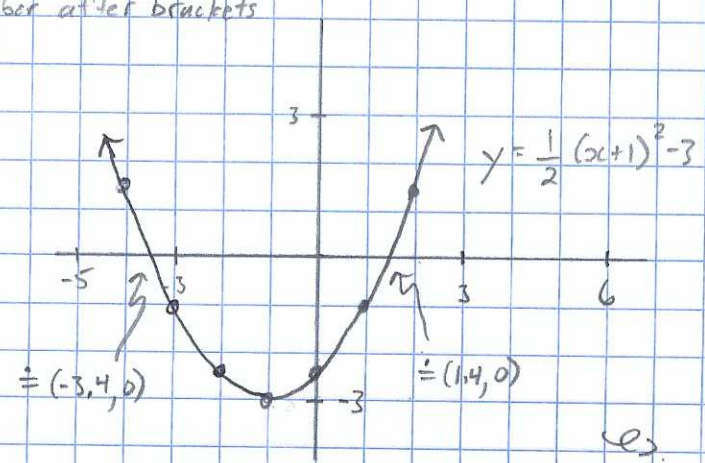
"take second number after brackets"

Sol'n

1. $V(-1, -3)$
2. "sub + solve"

x	y
0	$= \frac{1}{2}[(0)+1]^2 - 3 = -2.5$
1	$= \frac{1}{2}[(1)+1]^2 - 3 = -1$
2	$= \frac{1}{2}[(2)+1]^2 - 3 = 1.5$

3. Symmetry ✓



e)

c) Tough Question Alert!!

Identify the x-intercept(s) and y-intercept of the above parabola $y=\frac{1}{2}(x+1)^2-3$.

Soln

(y-intercept)

[Set $x=0$ and solve for y.]

$$y=\frac{1}{2}[(0)+1]^2-3$$

$$y=\frac{1}{2}[1]^2-3$$
$$y=\frac{1}{2}(1)-3$$
$$y=\frac{1}{2}-3$$
$$y=\frac{1}{2}-\frac{6}{2}$$
$$y=\frac{-5}{2}$$

(x-intercept)

[Set $y=0$ and solve for x.]

$$(0)=\frac{1}{2}[x+1]^2-3$$
$$+3 \qquad +3$$
$$2\times 3 = 2\times\frac{1}{2}(x+1)^2$$
$$6=(x+1)^2$$
$$\pm\sqrt{6}=\sqrt{(x+1)^2}$$
$$\pm\sqrt{6}=x+1$$
$$-1 \qquad -1$$
$$\pm\sqrt{6}-1=x$$

To isolate x, follow SAMDEB, the unclothing order.

→ So $x=\sqrt{6}-1$ or $x=-\sqrt{6}-1$
$\doteq 1.45$ $\doteq -3.45$

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3a-e, h
4

Graph i) $y=-(x-1)^2+5$
ii) $y=3(x-2)^2-4$

} Use desmos.com to check your work :)