Name: ______________________________ Date: ______________________________ Hour: ____Alg 1____

Unit 7B Day 11: Equations and Graphs in Vertex Form

Focus Question: Can I transfer between a graph and equation of a quadratic in vertex form?

A. Vertex Form:

1. Without graphing, give all the information you can about the graph of each function.

a. $g(x) = \frac{1}{4}(x-3)^2 - 4$

vertex (3, -4)

a.o.s. x = 3

~~horizontally~~

Vertical compressed

b. $f(x) = -2|x+4| + 6$

Vertical stretch flipped

vertex (-4, 6)

a.o.s. x = -4

You can very quickly identify the vertex in the functions above, thus, the following functions demonstrate **vertex form of a quadratic** or **standard form of an absolute value.**

$f(x) = a(x-h)^2 + k$	$g(x) = a\|x-h\| + k$

2. Why is it called "vertex form" of a quadratic?

you can immediately tell the vertex

3. Tell what all of the information in the functions represents by filling in the blanks.

a. The vertex is at (h, k).

b. The graph is symmetrical about the line x = h.

c. If a > 0, the parabola opens/is concave up and the vertex is a minimum.

d. If a < 0, the parabola opens/is concave down and the vertex is a maximum.

e. If $|a| > 1$ the parabola (or V) is skinny or vertically stretched.

f. If $0 < |a| < 1$, the parabola (or V) is wide or vertically compressed.

g. The y intercept can be found by finding f(0) which means subst. 0 for x & simplify

h. The function can have 0, 1, or 2 zeros. These are also called solutions or x intercepts. In the case of quadratics, they are also called roots.

B. From an Equation to a graph (should be review!)

1. The rest of the unit we will focus only on quadratics. What situations do you think will create a quadratic graph?

2. How many points do you need to accurately graph a quadratic? Explain your answer.

5 points 1) vertex

2) yint..... 3) use symmetry

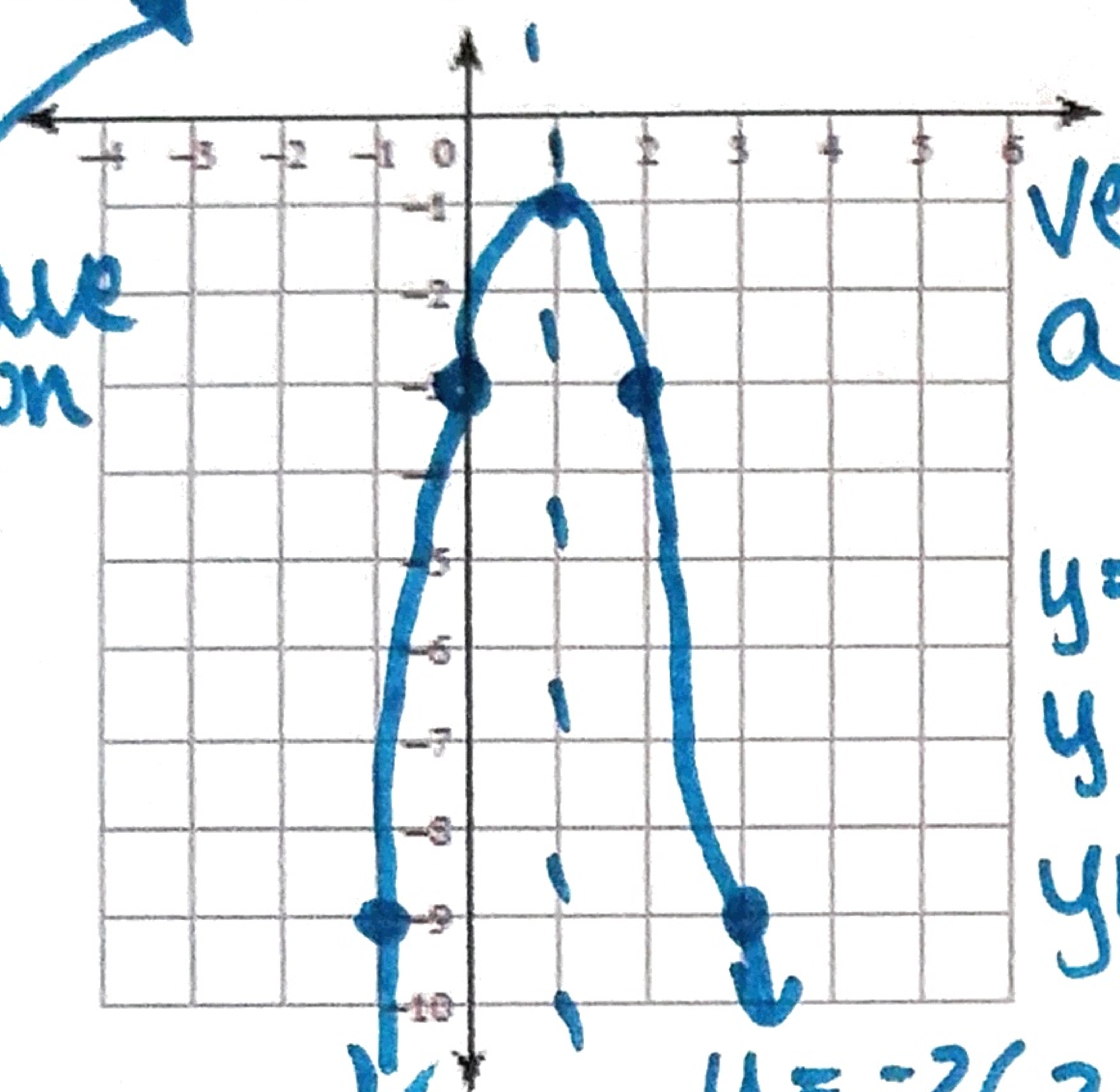
4) pick x value..... 5) use symm.

3.For each quadratic below give the following information and then graph the function.

* Concavity * Vertex * Axis of symmetry * y-intercept *One additional point

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

concave down



vertex $(1,-1)$

a.o.s. $x=1$

$y = -2(0-1)^2 - 1$

$y = -3$

yint $(0,-3)$

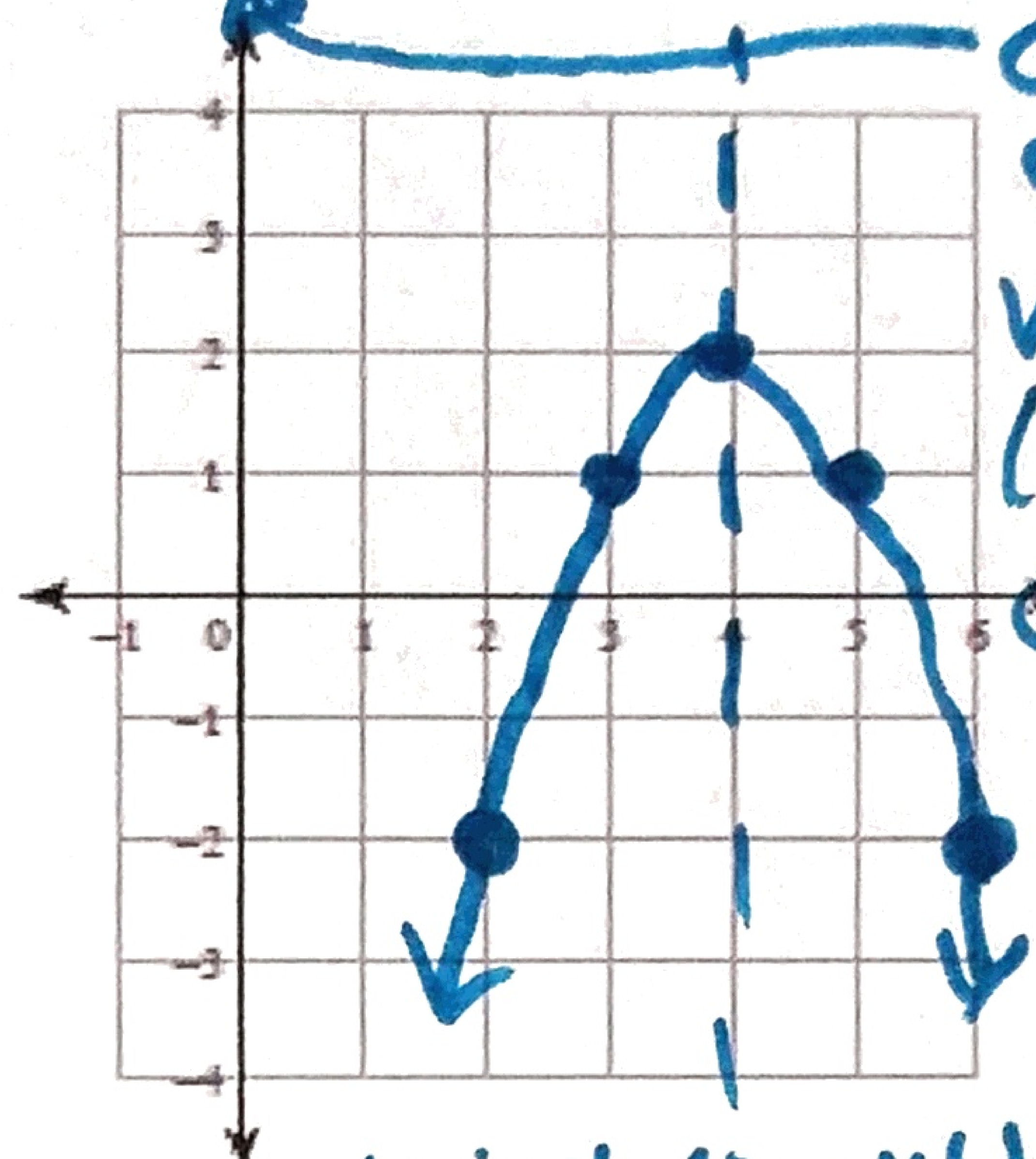
$y = -2(3-1)^2 - 1$

$y = -9$

$(3,-9)$

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

concave down



vertex $(4,2)$

a.o.s. $x=4$

yint $(0,-14)$

$y = -(0-4)^2 + 2$

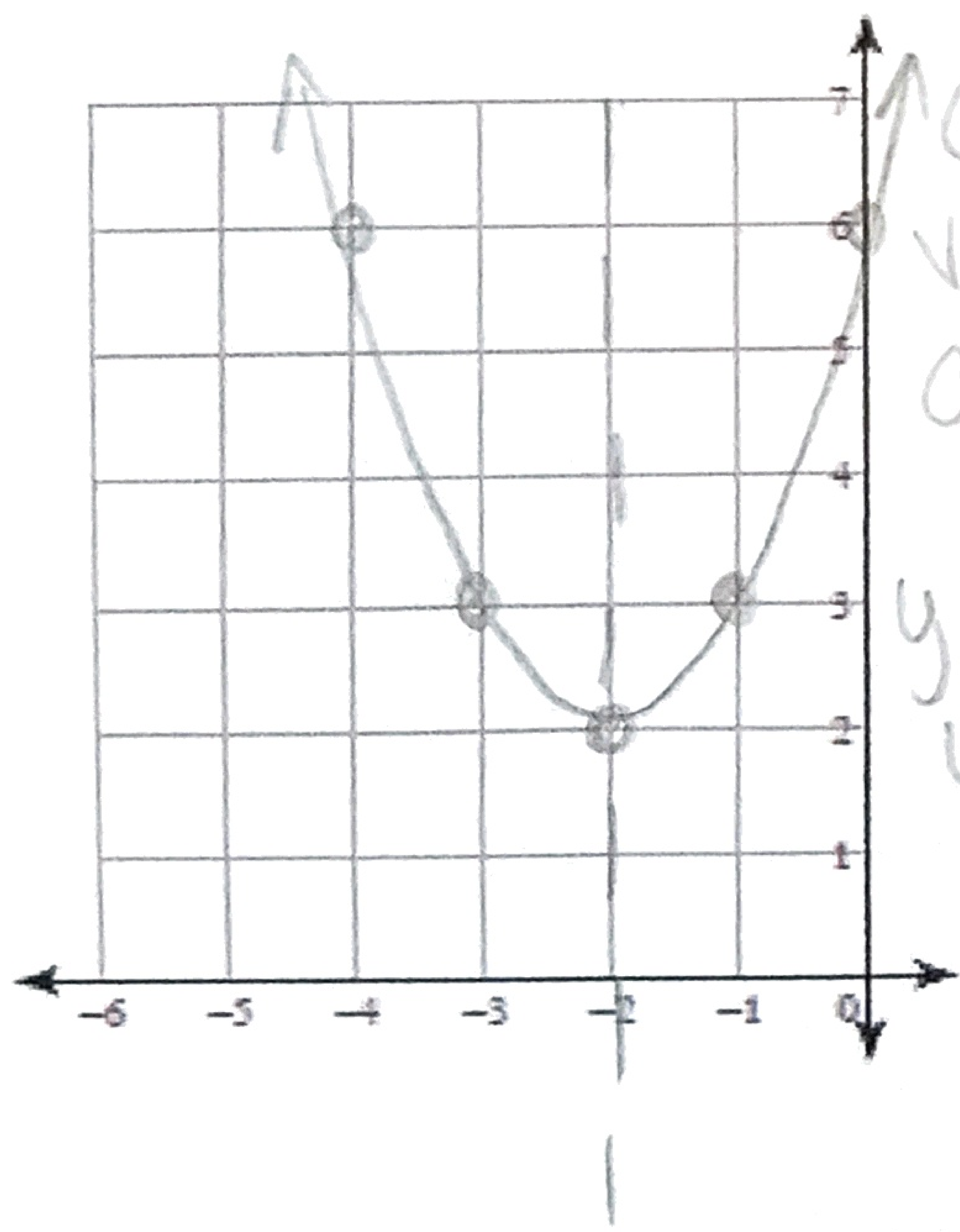
$y = -14$

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

$y = -2$

$(2,-2)$

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



concave up

vertex $(-2,2)$

a.o.s. $x=-2$

yint $(0,6)$

$y = (0+2)^2 + 2$

$y = 2^2 + 2$

$y = 4+2$

$y = 6$

additional point

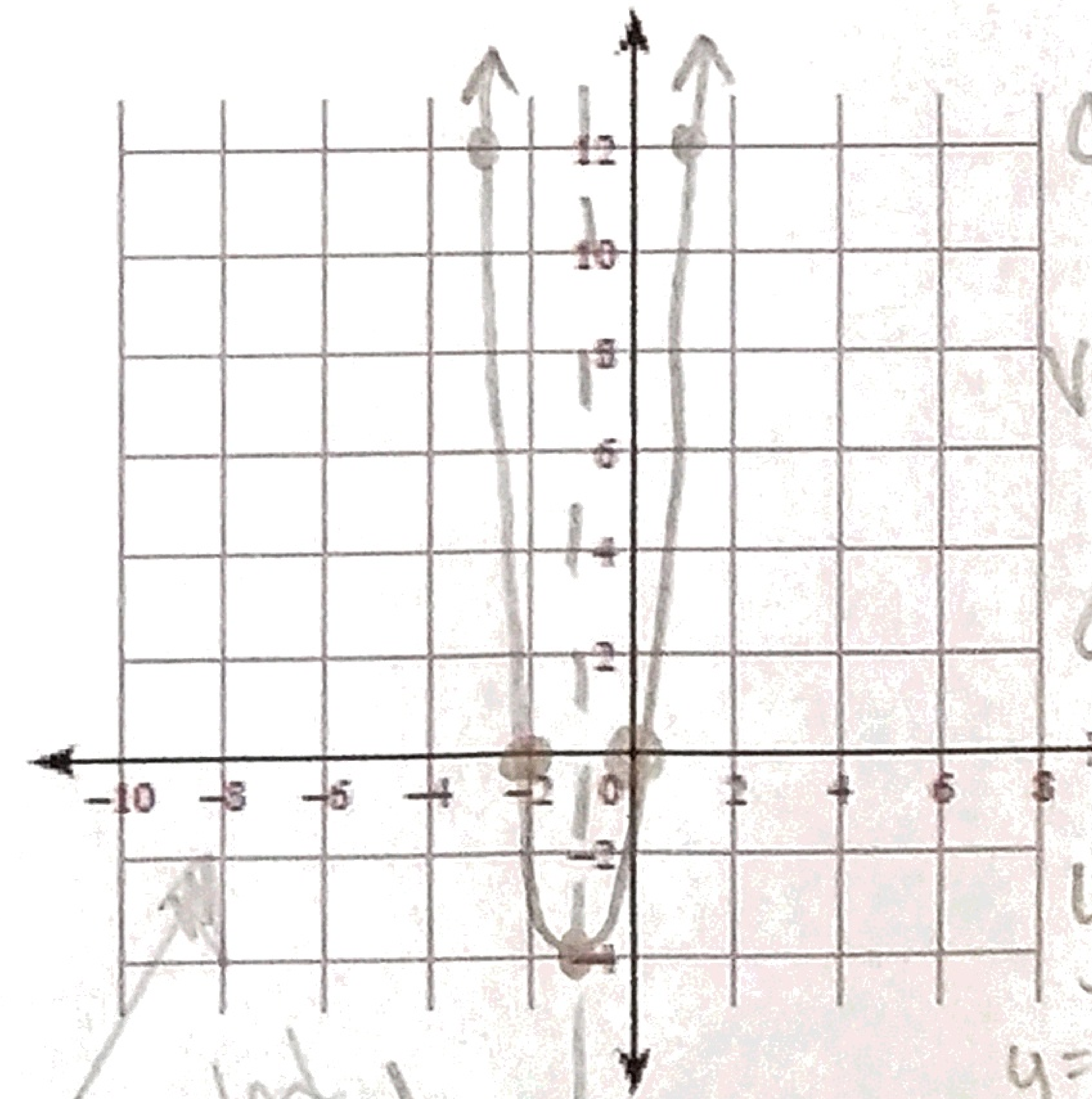
$x = -1$ $(-1,3)$

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

$y = (1)^2 + 2$

$y = 3$

4) $y = 4(x+1)^2 - 4$



scaled by 2's!

concave up

vertex $(-1,-4)$

a.o.s $x=-1$

yint $(0,0)$

$y = 4(0+1)^2 - 4$

$y = 4(1)^2 - 4$

$y = 4-4$

$y = 0$

additional pt

$x=1$ $y = 4(1+1)^2 - 4$

$(1,12)$ $y = 4(2)^2 - 4$

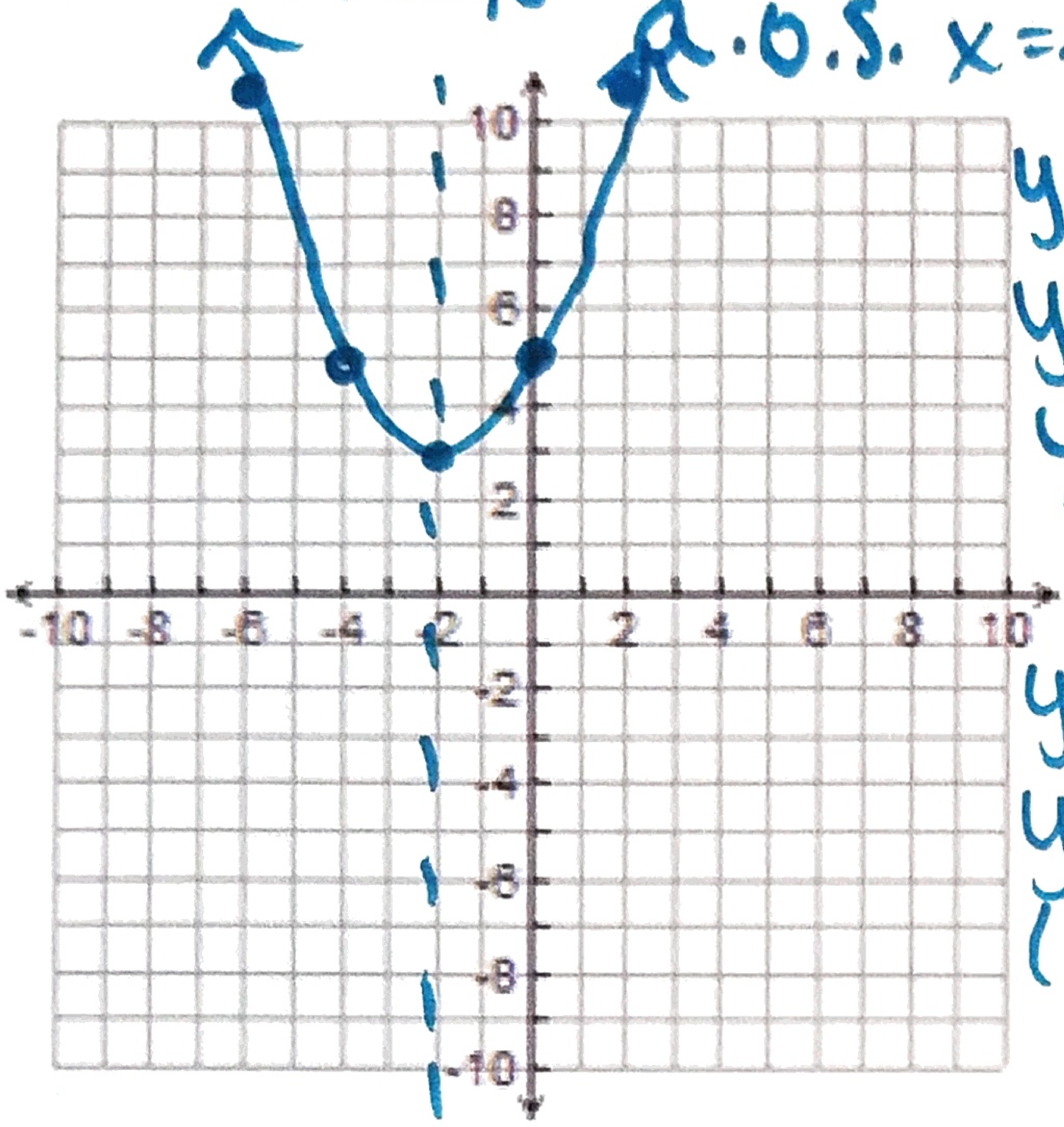
$y = 16 - 4$

$y = 12$

5. $f(x)=\frac{1}{2}(x+2)^2+3$

concave up vertex $(-2,3)$

a.o.s. $x=-2$



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

$y=5$

yint $(0,5)$

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

$y=11$

$(2,11)$

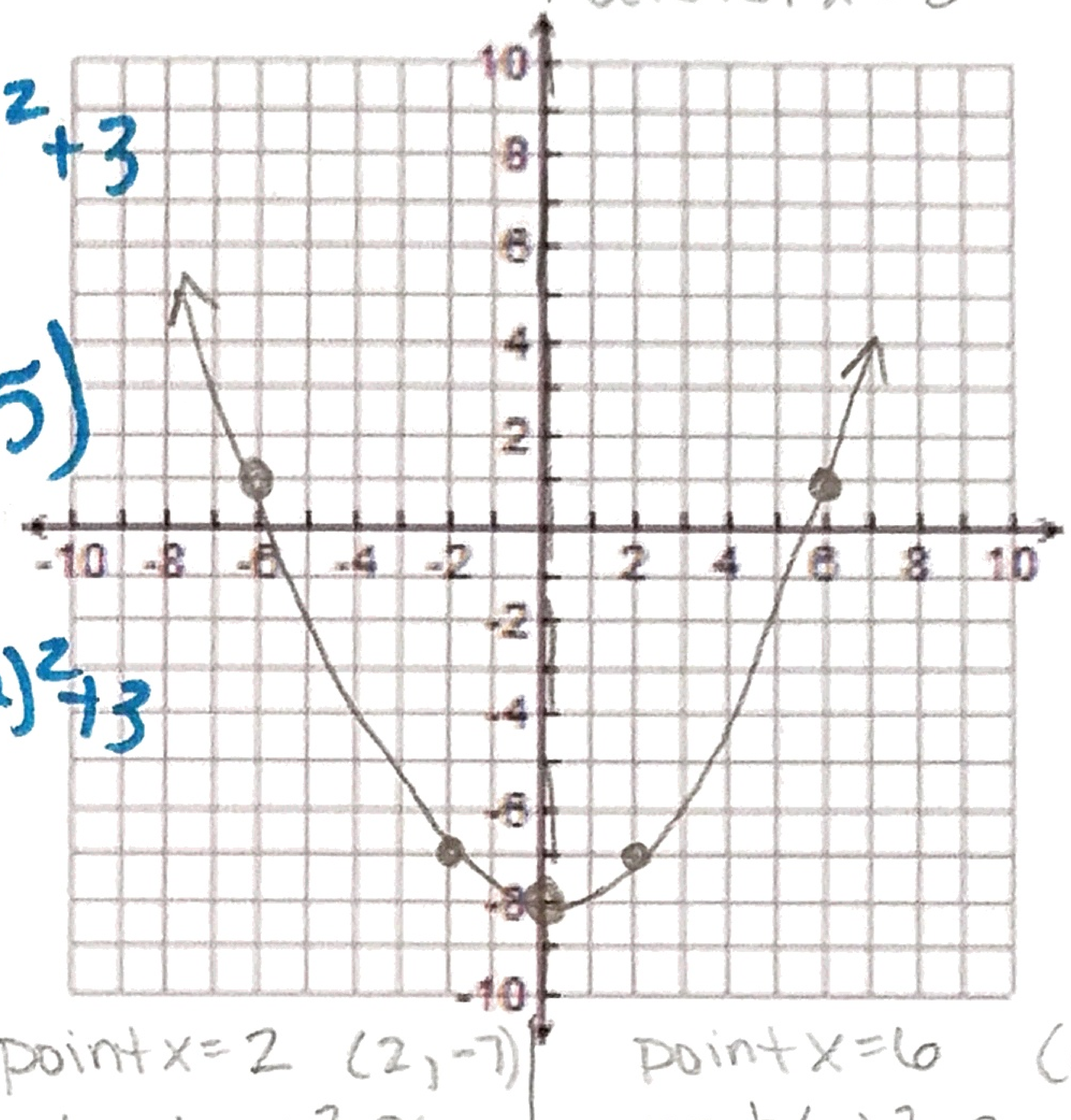
6. $f(x)=\frac{1}{4}x^2-8$

concave up

vertex $(0,-8)$

yint!

a.o.s. $x=0$



point $x=2$ $(2,-7)$

$y=\frac{1}{4}(2)^2-8$

$y=\frac{1}{4}(4)-8$

$y=1-8$

point $x=6$ $(6,1)$

$y=\frac{1}{4}(6)^2-8$

$y=\frac{1}{4}(36)-8$

$y=9-8$

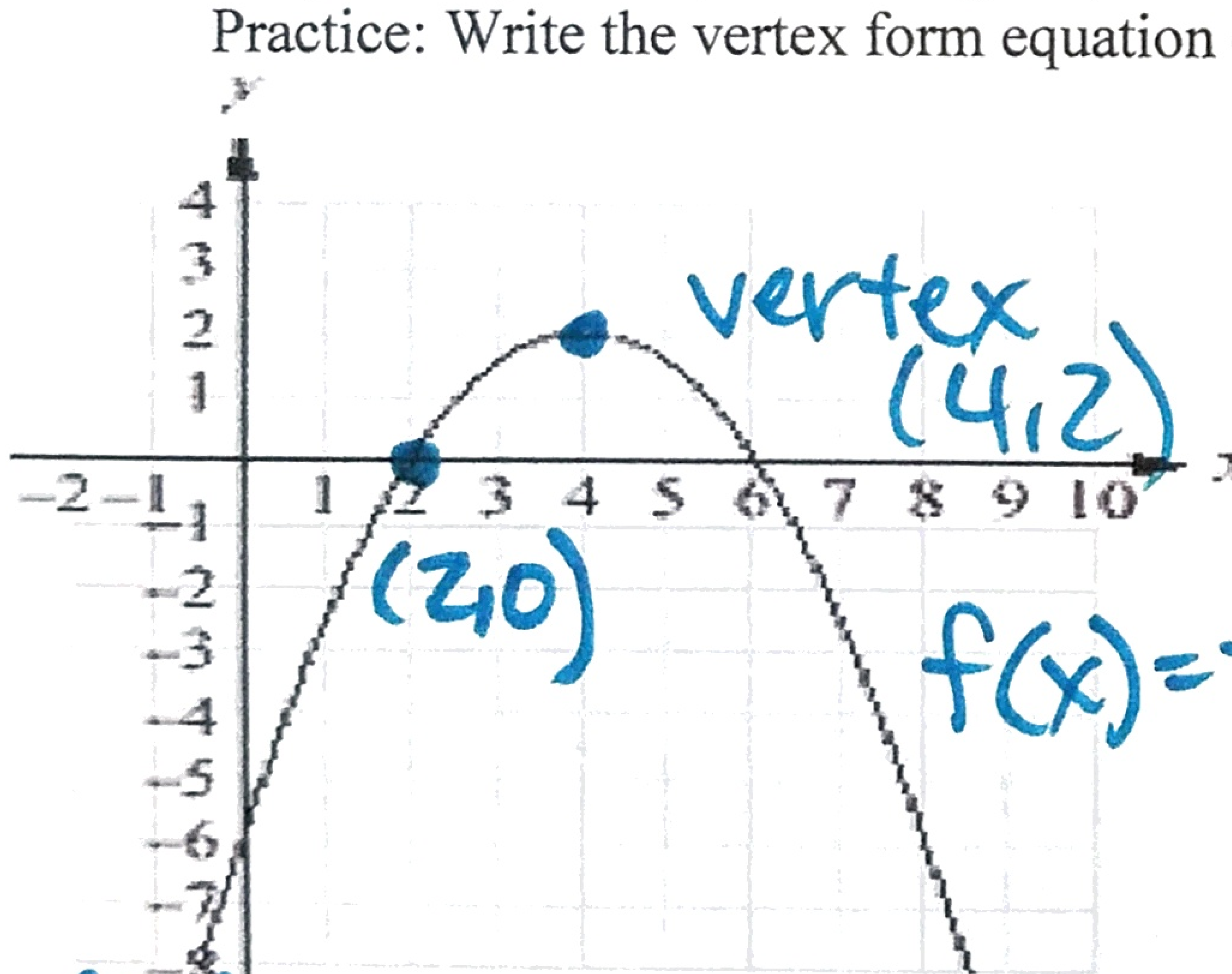
Through $(6,2)$ with $m=4$ $y=mx+b$

x y

$2=4(6)+b$

C. Graph to Equation (a little tougher!)

Practice: Write the vertex form equation of each quadratic function. **Show all work to find *a*.**



vertex $(4,2)$

$(2,0)$

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

$f(x)=a(x-h)^2+k$

$0=a(2-4)^2+2$

$0=a(-2)^2+2$

$0=a(4)+2$

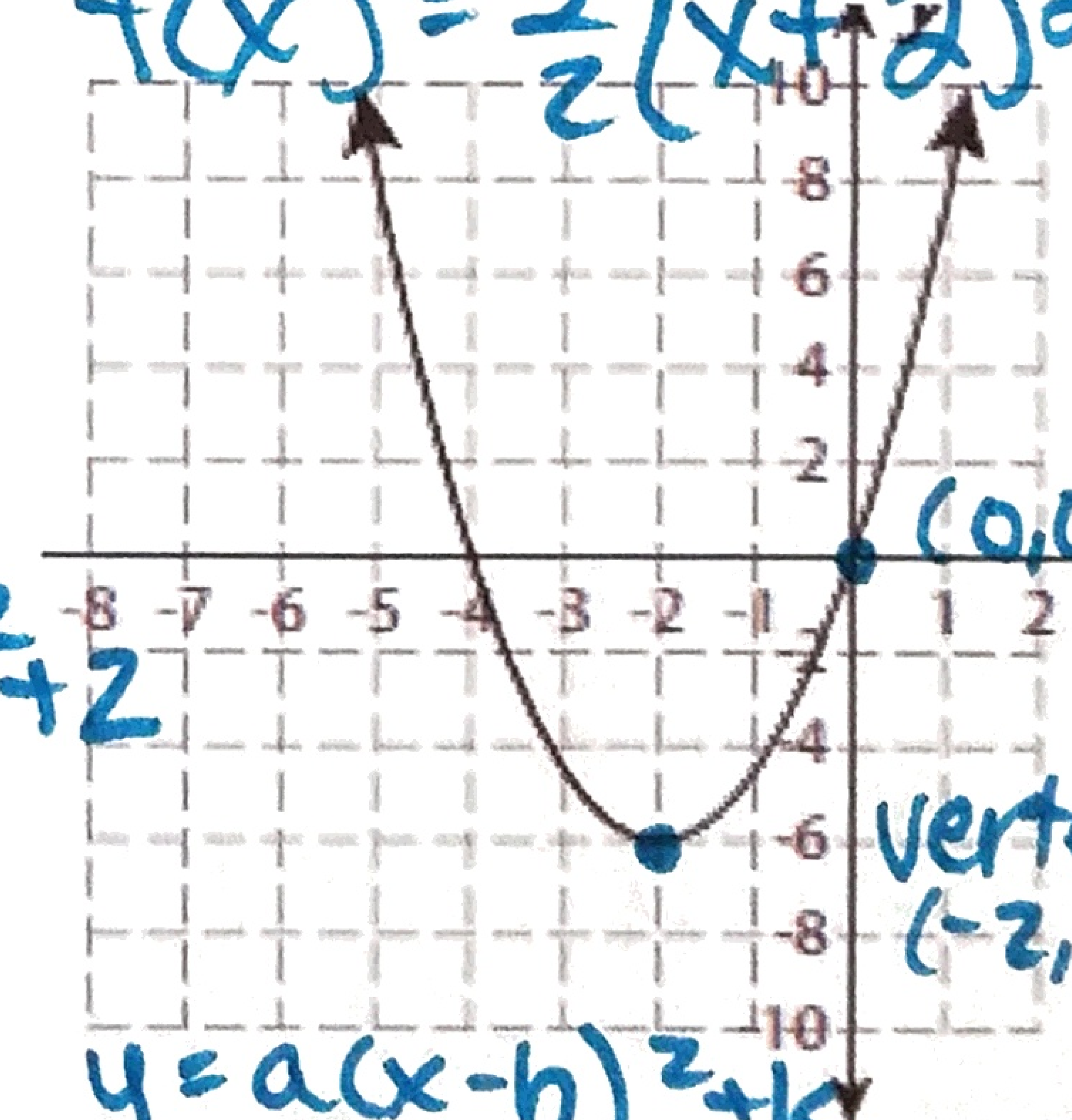
$-2 \quad -2$

$-2=4a$

$\frac{-2}{4}=\frac{4a}{4}$

$a=-\frac{1}{2}$

$f(x)=\frac{3}{2}(x+2)^2-6$



$(0,0)$

vertex $(-2,-6)$

$y=a(x-h)^2+k$

$y=a(x+2)^2-6$

$0=a(0+2)^2-6$

$0=a(2)^2-6$

$0=a(4)-6$

$+6 \quad +6$

$6=4a$

$\frac{6}{4}=\frac{4a}{4}$

$\frac{3}{2}=a$

3. The quadratic has a vertex at (-2, -6) and goes through the point (1, 8)

vertex (-2, 4)
through (1, 8)

$f(x) = a(x-h)^2 + k$

$f(x) = a(x+2)^2 + 4$

$8 = a(1+2)^2 + 4$

$8 = a(3)^2 + 4$

$-4 \qquad -4$

$\frac{4}{9} = \frac{9a}{9}$ $\quad a = 4/9$

$f(x) = \frac{4}{9}(x+2)^2 + 4$

4. The quadratic has a vertex at (9, 6) and an x intercept of (12, 0)

$f(x) = a(x-h)^2 + k$ (x y)

$f(x) = a(x-9)^2 + 6$

$0 = a(12-9)^2 + 6$

$0 = a(3)^2 + 6$

$0 = a(9) + 6$

$-6 \qquad -6$

$\frac{-6}{9} = \frac{9a}{9}$

$a = -2/3$

$f(x) = -2/3(x-9)^2 + 6$