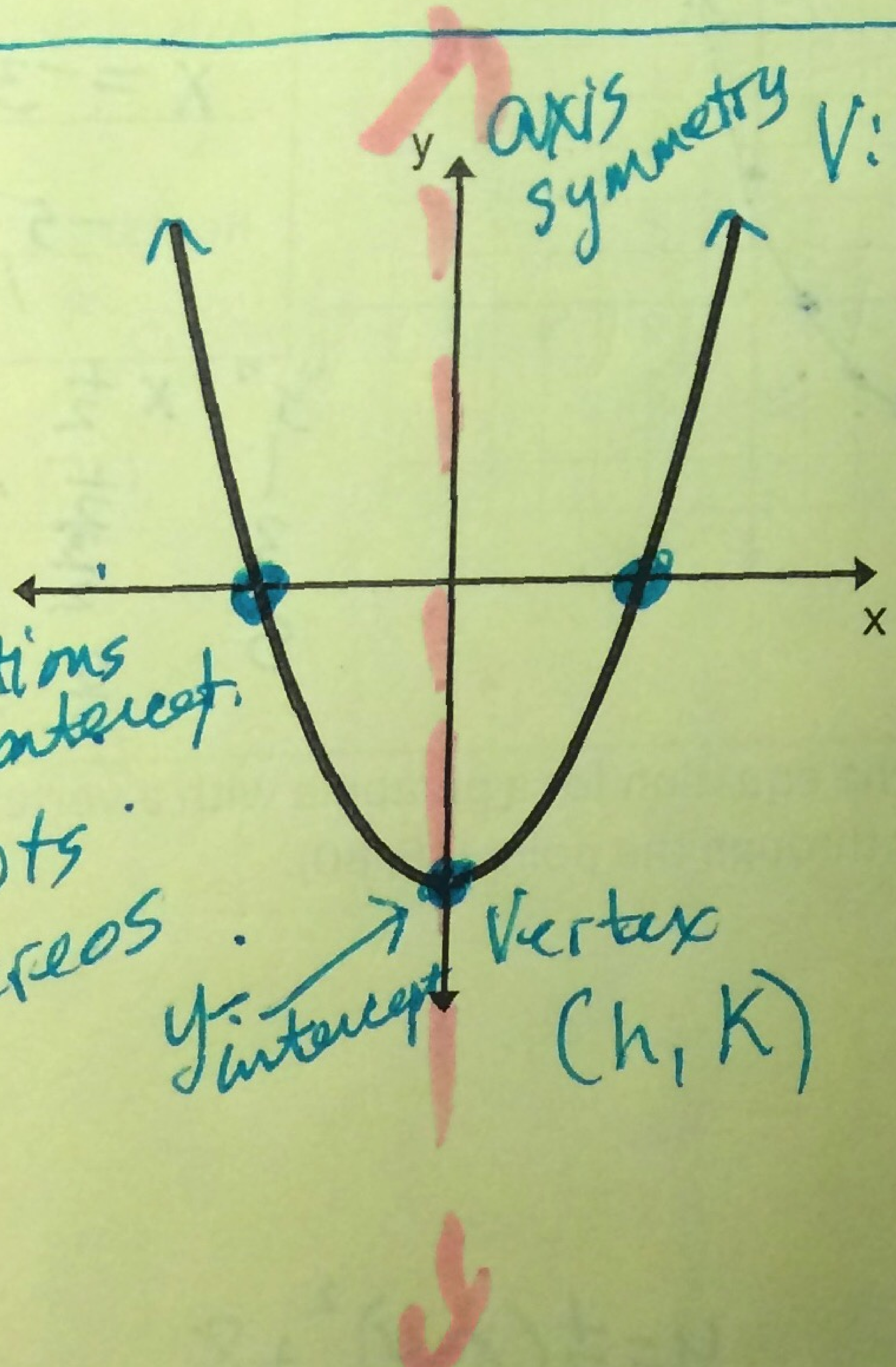
2

Parabolas

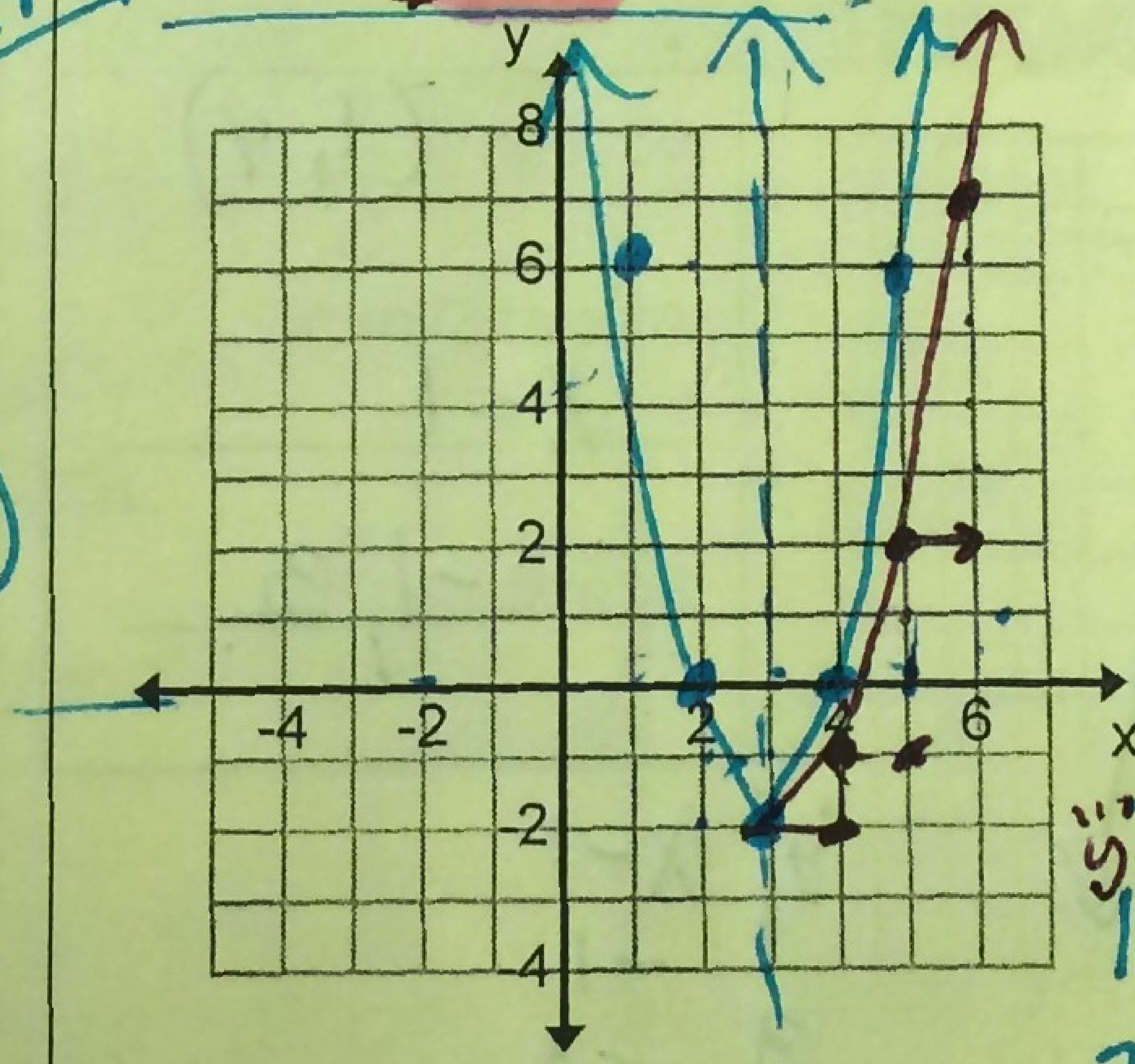
$$\boxed{f(x) = a(x-h)^2 + k}$$

Vertex Form



1. $f(x) = 2(x-3)^2 - 2$

opposite



Vertex: $(+3, -2)$

Axis of Symm: $x = 3$

Roots: $2, 4$

pattern

x	A
1	2
3	6
5	10

Substitution

2. Write the equation for a parabola with a vertex of (-7,5) that goes through the point (-5, 13).

Substitution

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

$13 = a(-5 \cancel{-} (-7))^2 + 5$

$13 = a(4) + 5$

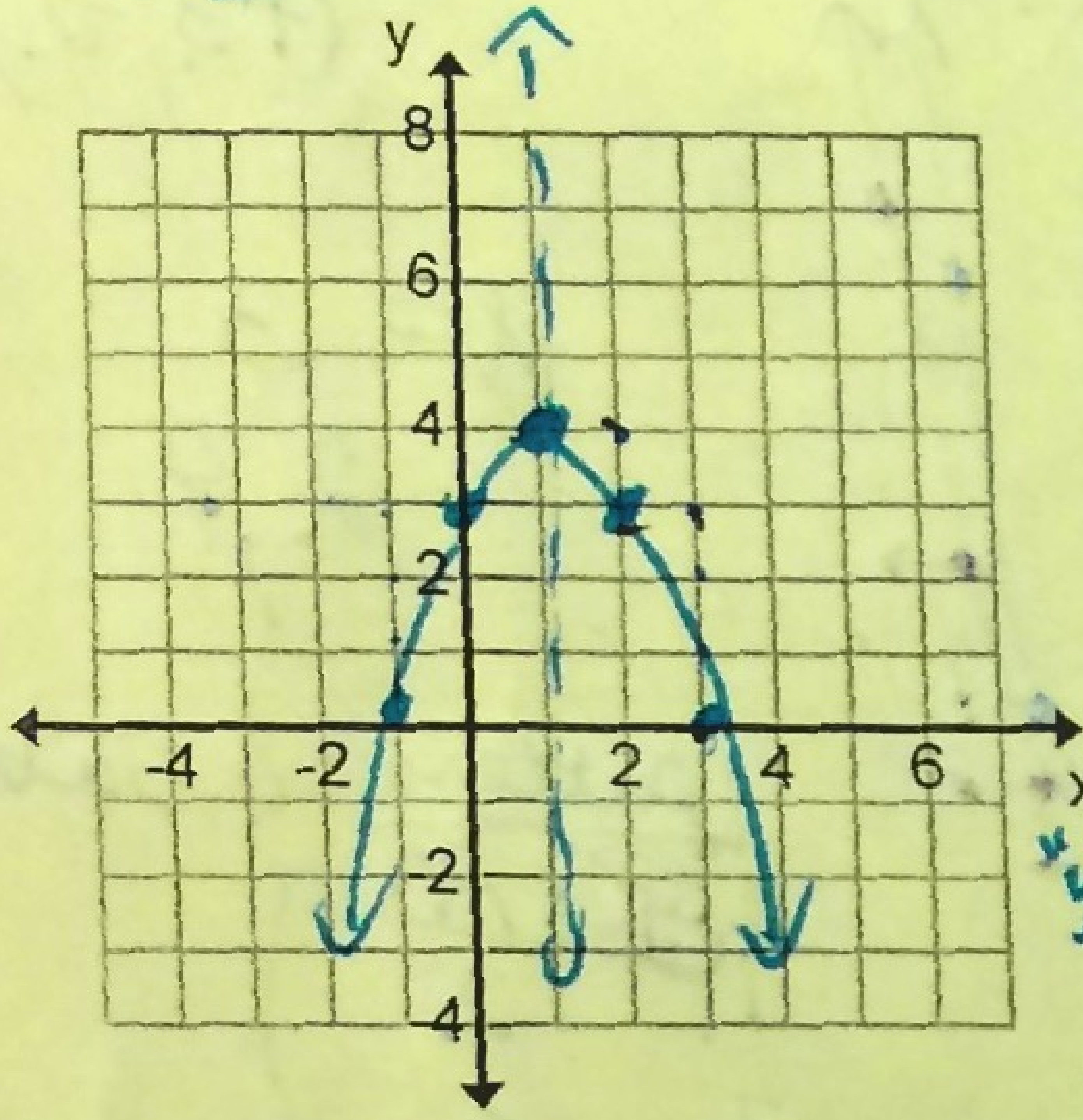
$8 = a(4)$

$\boxed{a = 2}$

$y = 2(x+7)^2 + 5$

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

3. ~~$f(x) = 2(x-3)^2 - 2$~~



Vertex: $(1, 4)$

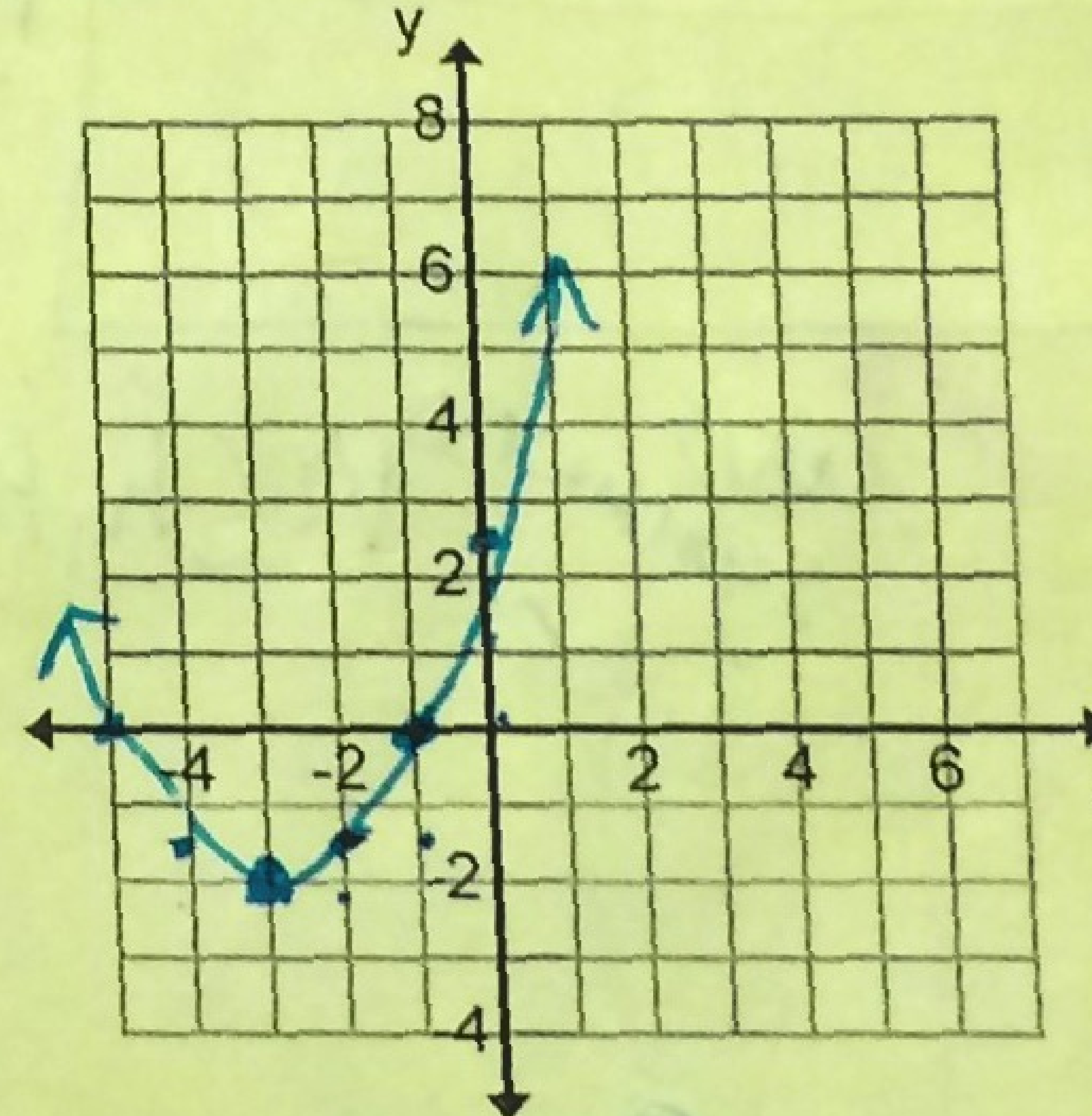
Axis of Symm: $x=1$

Roots: $-1, 3$

"y"	$x-1$
1	-1
3	-3
5	-5

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

4. ~~$f(x) = 2(x-3)^2 - 2$~~



Vertex: $(-3, -2)$

Axis of Symm: $x=-3$

Roots: $-5, -1$

"y"	$x \cdot \frac{1}{2}$	
1	$\frac{1}{2}$	.5
3	$\frac{3}{2}$	1.5
5	$\frac{5}{2}$	2.5

5. Write the equation for a parabola with a vertex of $(-3,-5)$ that goes through the point $(-6, -23)$.

$$\overset{h}{-3},\ \overset{k}{-5} \qquad \overset{x}{-6},\ \overset{y}{-23}$$

$$y=a(x-h)^2+k$$
$$-23=a(-6-(-3))^2+-5$$
$$-23=9a-5$$
$$-18=9a$$
$$\boxed{-2=a}$$
$$\boxed{y=-2(x+3)^2-5}$$

6. Write the equation for a parabola with a vertex of $(4,8)$ that goes through the point $(16, 80)$.

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

Roots, Solutions, Zeroes, x-intercepts

Vertex Form

7. Factoring	8. Quadratic Formula	9. Square Root
1) GCF 2) Diff. Sq. * 3) Trinomial $Ax^2+Bx+C=0$ ① Set = zero ② Factor ③ Set Each Factor = zero.	Works Every time $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $Ax^2+Bx+C=0$ * set = to zero	$\sqrt{x^2}=\sqrt{25}$ $x=\pm 5$ $\sqrt{(x-3)^2}=\sqrt{5}$ $x-3=\pm\sqrt{5}$ $\boxed{x=3\pm\sqrt{5}}$
A) $2x^3+2x^2-24x=0$ -12, -34 $2x(x^2+x-12)=0$ $2x(x-3)(x+4)=0$ $\boxed{x=0,\ 3,\ -4}$	A) $x^2-5x+3=0$ $A=1 \quad B=-5 \quad C=3$ $x=\frac{5\pm\sqrt{(-5)^2-4(1)(3)}}{2(1)}$ $x=\frac{5\pm\sqrt{13}}{2}$	A) $(x+6)^2-5=0$ $\sqrt{(x+6)^2}=\sqrt{5}$ $x+6=\pm\sqrt{5}$ $\boxed{x=-6\pm\sqrt{5}}$
B) $\boxed{2}x^2-5x-\underline{12}=0$ -24 $\frac{3}{2}\ \frac{-8}{2}$ $\frac{3}{2}\ -4$ $(x-4)(2x+3)=0$ $\boxed{x=4,\ \frac{-3}{2}}$	B) $5x^2+2x-12=0$ $=\frac{-2\pm2\sqrt{61}}{10}=\frac{-1\pm\sqrt{61}}{5}$	C) $2(x-2)^2-6=0$ $2(x-2)^2=6$ $\sqrt{(x-2)^2}=\sqrt{3}$ $\boxed{x=+2\pm\sqrt{3}}$

Completing the Square to convert a **Quadratic** to **Vertex Form**

$\frac{1}{2}$ middle term (B) squared

$y = x^2 + 6x + 15$

$y = (x^2 + 6x + 3^2) + 15 - 9$

$\boxed{y = (x+3)^2 + 6}$

V: (-3, 6)

10. Rewrite the quadratic in vertex form by completing the square. Then graph the parabola and find the requested information.

y-int

$y = x^2 - 12x$ [redacted] $+37$

$y = (x^2 - 12x + 6^2) + 37 - 36$

$\boxed{y = (x-6)^2 + 1}$

$0 = (x-6)^2 + 1$

$\sqrt{-1} = \sqrt{(x-6)^2}$

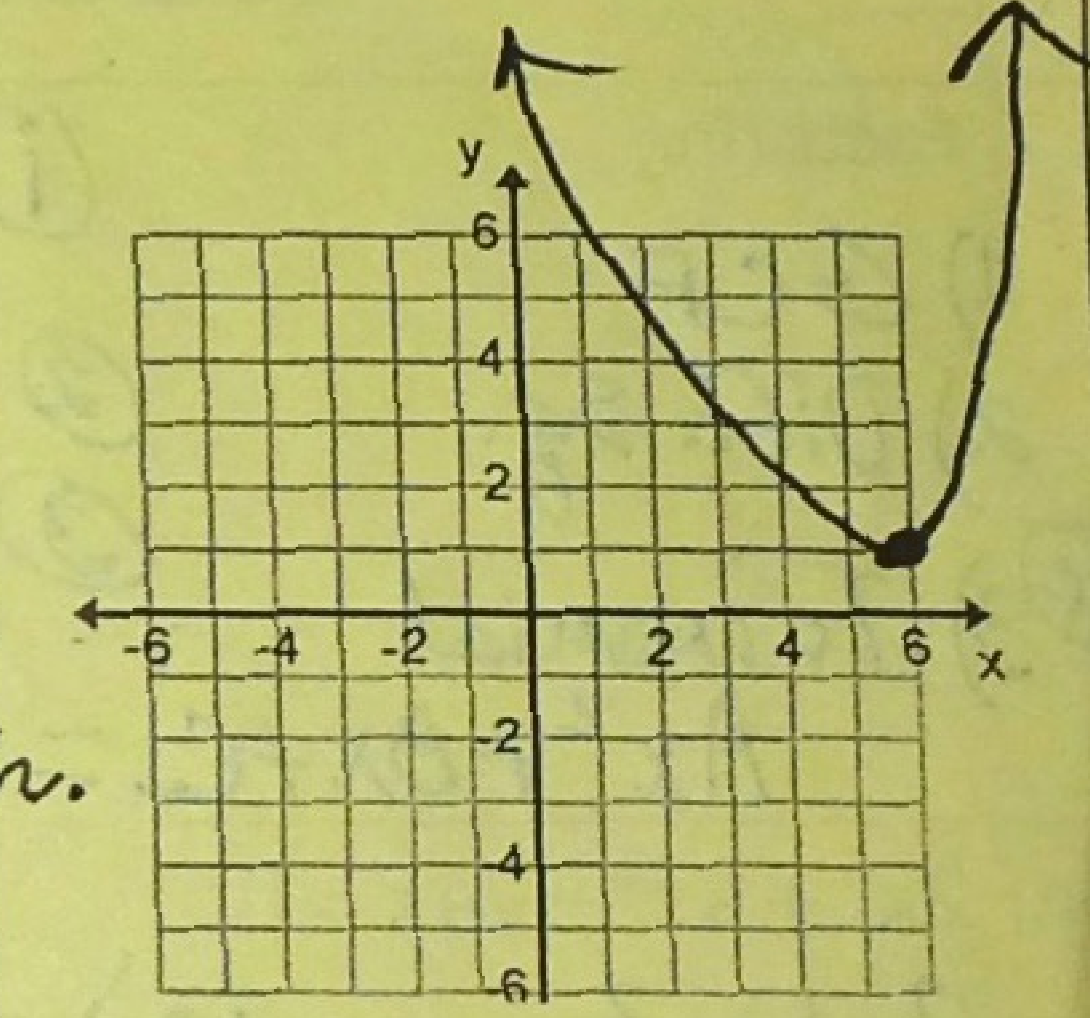
Not real

Equation in Vertex Form:

Vertex: (6, 1)

Zeroes: real no solution.

Y-int: 37



11. Rewrite the quadratic in vertex form by completing the square. Then graph the parabola and find the requested information.

$y = x^2 + 6x$ [redacted] $+5$

$y = (x^2 + 6x + 3^2) + 5 - 9$

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

$0 = (x+3)^2 - 4$

$\sqrt{4} = \sqrt{(x+3)^2}$

$\pm 2 = x + 3$

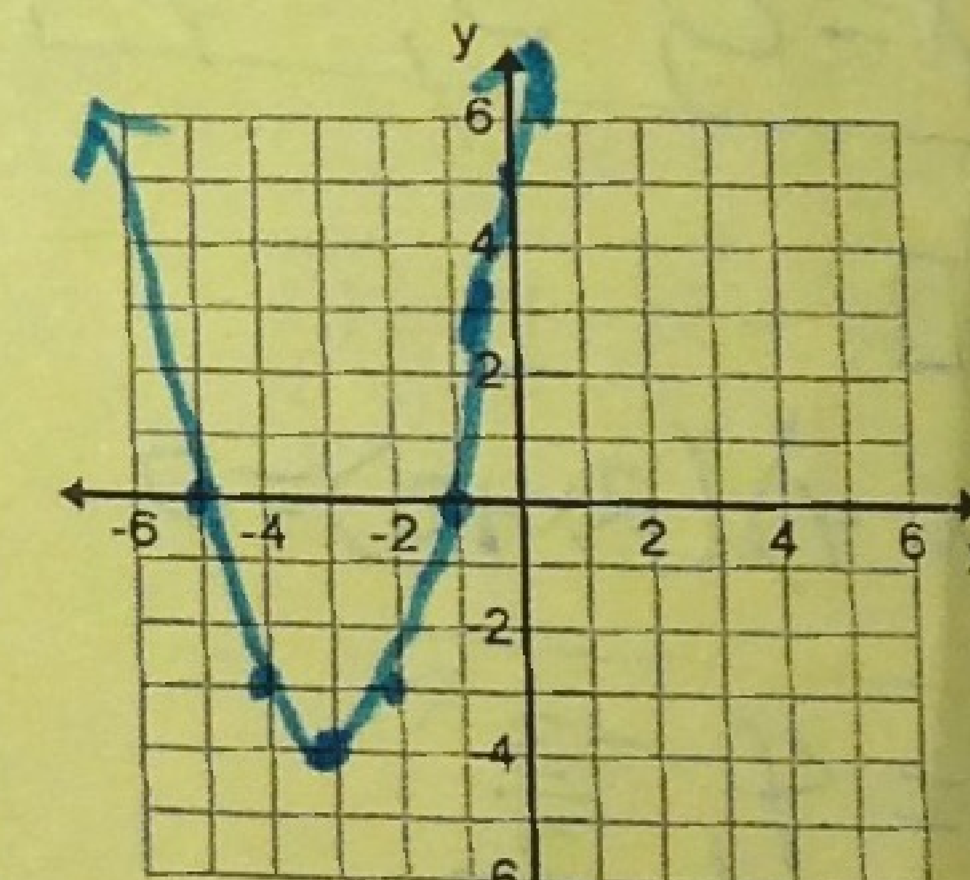
$x = -1, -5$

Equation in Vertex Form:

Vertex: (-3, -4)

Zeroes: -1, -5

Y-int: 5



x-value of the vertex

$x = \frac{-12 \pm \sqrt{12^2 - 4(-3)(-5)}}{2(-3)} = \frac{-12 \pm \sqrt{84}}{-6} = \frac{-12 \pm 2\sqrt{21}}{-6} = \boxed{\frac{6 \pm \sqrt{21}}{3}}$

Using $\boxed{x = \frac{-b}{2a}}$ to find the Vertex of a Quadratic Equation

V: $\left(-\frac{1}{4}, \frac{79}{8}\right)$

$y = 2x^2 + x + 10$

$A = 2 \quad B = 1 \quad C = 10$

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

$y = 2\left(-\frac{1}{4}\right)^2 + -\frac{1}{4} + 10$

$y = \frac{79}{8} \approx 9.875$

12. Rewrite the quadratic in vertex form by using $x = \frac{-b}{2a}$. Then graph the parabola and find the requested information.

$y = -3x^2 + 12x - 5$

$A = -3 \quad B = 12 \quad C = -5$

$x = \frac{-12}{2(-3)} = \frac{-12}{-6} = 2$

$y = -3(2)^2 + 12(2) - 5$

$y = 7$

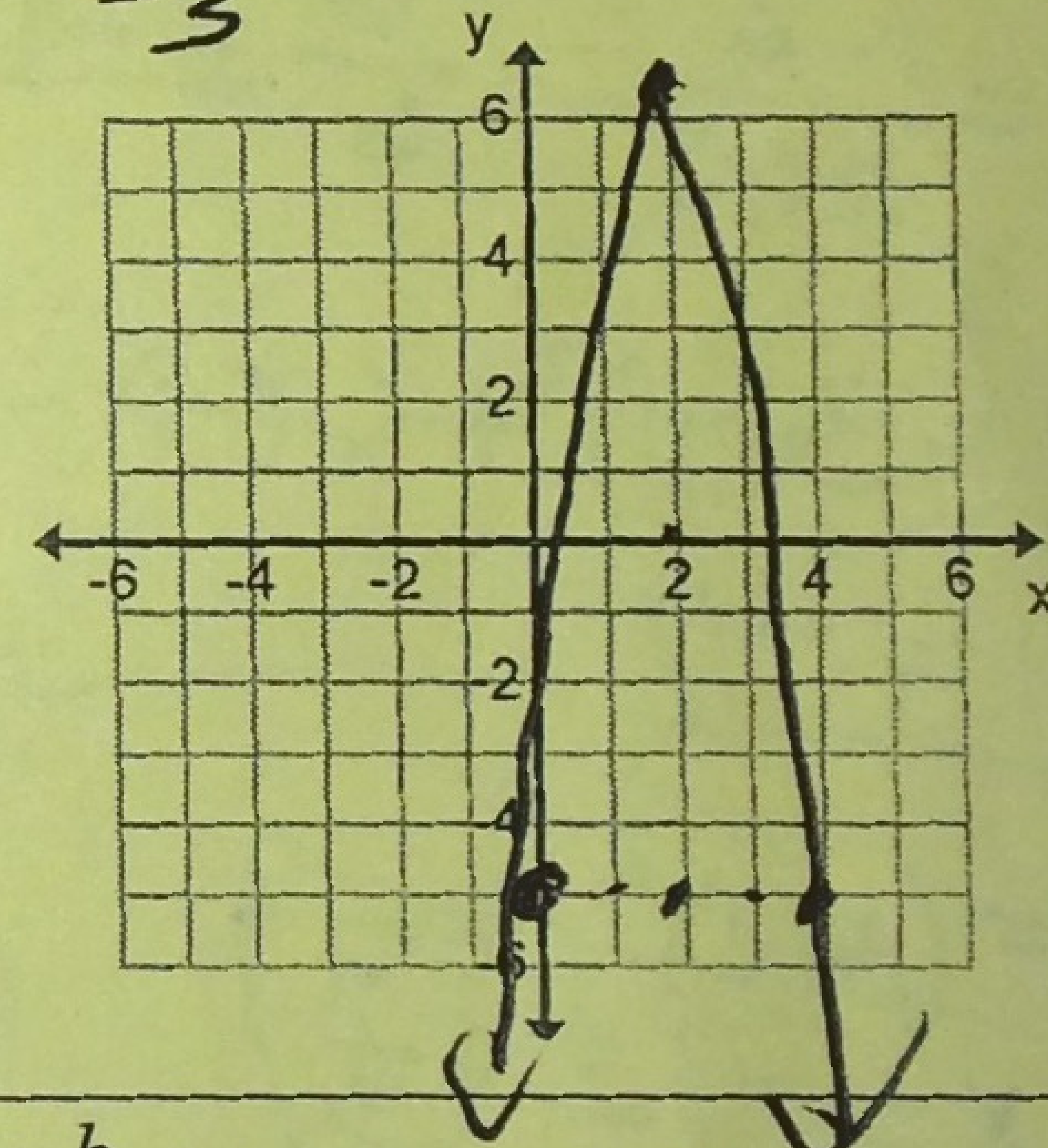
Equation in Vertex Form: $y = -3(x-2)^2 + 7$

Vertex: $(2, 7)$

Zeroes: ________

Y-int: -5

$\frac{-9}{-3} = -3(x-2)^2$



13. Rewrite the quadratic in vertex form by using $x = \frac{-b}{2a}$. Then graph the parabola and find the requested information.

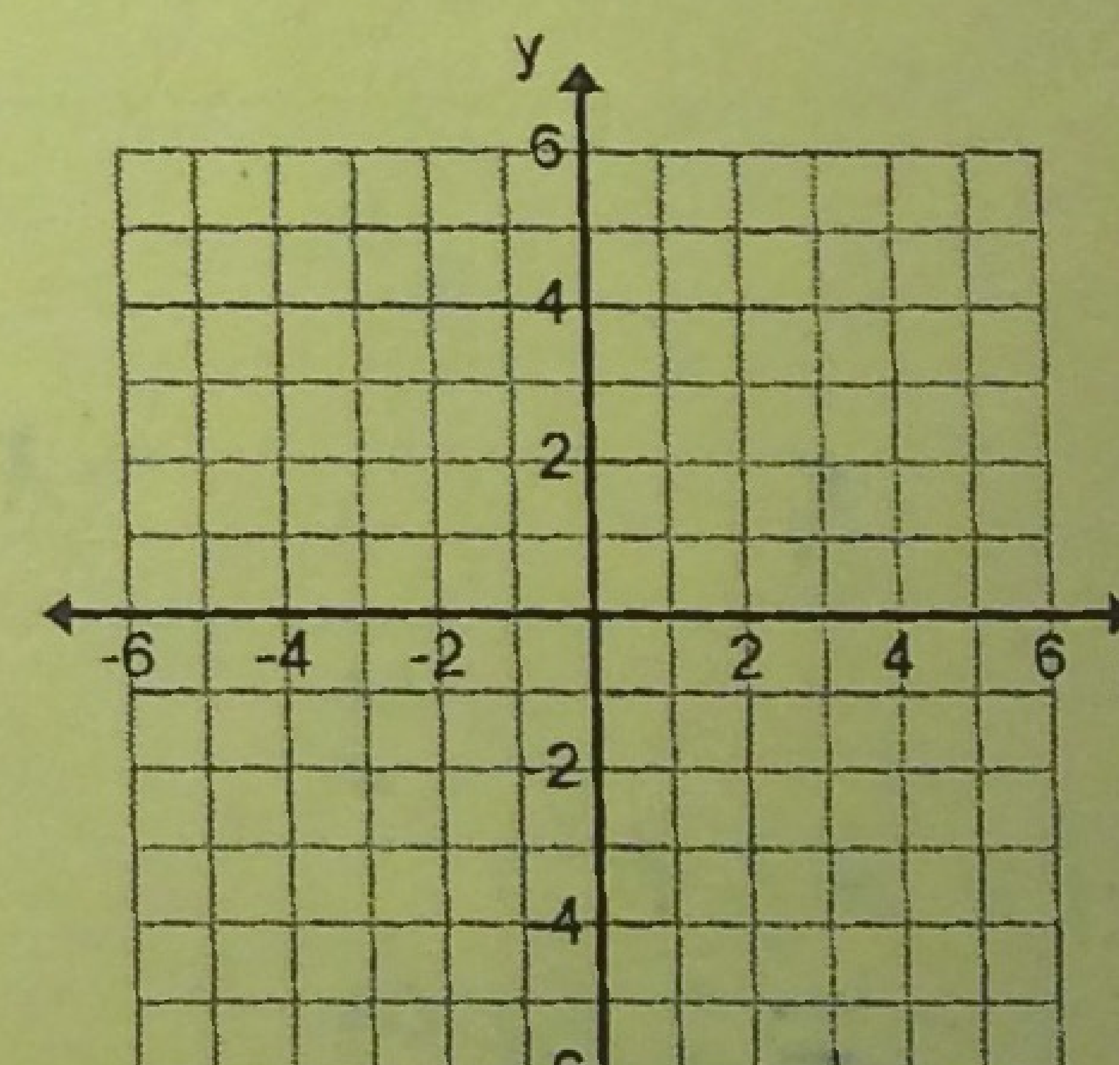
$y = \frac{1}{2}x^2 - 8x - 5$

Equation in Vertex Form:

Vertex:

Zeroes: ________

Y-int: ________



14. Find the vertex and zeroes:

$y = 3x^2 + 6x - 4$

a

$x = \frac{-b}{2a}$

$x = \frac{-6}{2(3)} = \frac{-6}{6} = -1$

V: $(-1, -7)$

$y = 3(-1)^2 + 6(-1) - 4$

$y = -7$

$\boxed{y = 3(x+1)^2 - 7}$

$\frac{7}{3} = (x+1)^2$

$x = -1 \pm \sqrt{\frac{7}{3}}$

15. Find the vertex and zeroes:

a

$y = -2x^2 + 12x - 16$

V: $(3, 2)$

$x = \frac{-12}{2(-2)} = \frac{-12}{-4} = 3$

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

$y = -2(3)^2 + 12(3) - 16$

$y = 2$

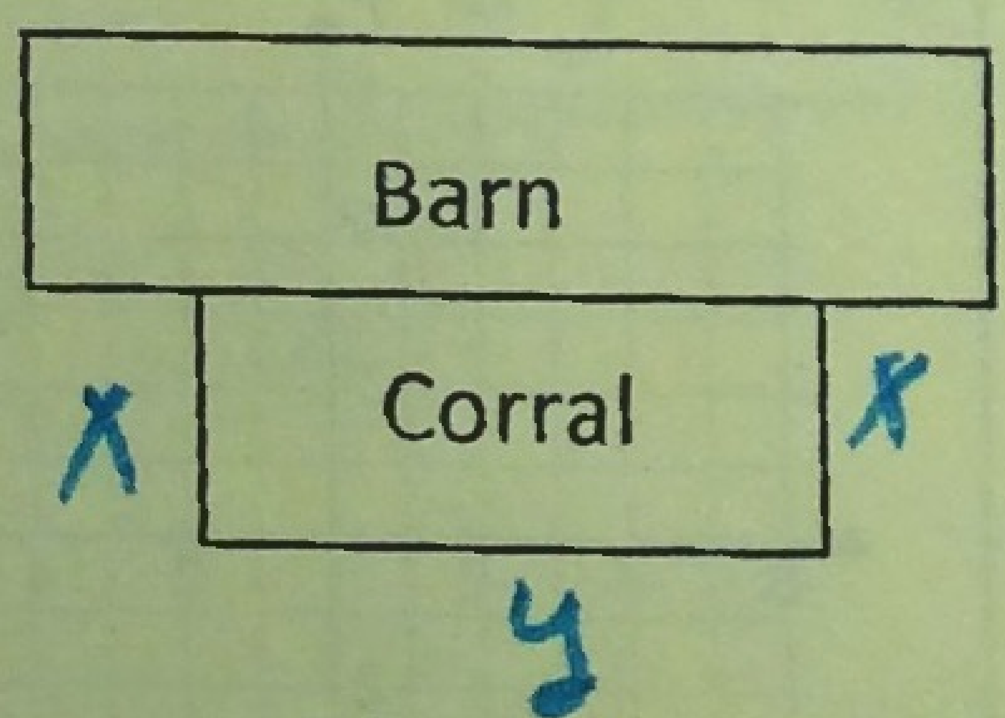
Zeroes

$0 = -2(x-3)^2 + 2$

$1 = (x-3)^2$

$x = 3 \pm \sqrt{1} = \boxed{4, 2}$

16. A fence is to be built to form a rectangular corral along the side of a barn 65 feet long. If 120 feet of fencing are available, what are the dimensions of the corral of maximum area?



$A = x \cdot y$

$A = x(120 - 2x)$

$x = 0$

$120 - 2x = 0$

$-2x = -120$

$x = 60$

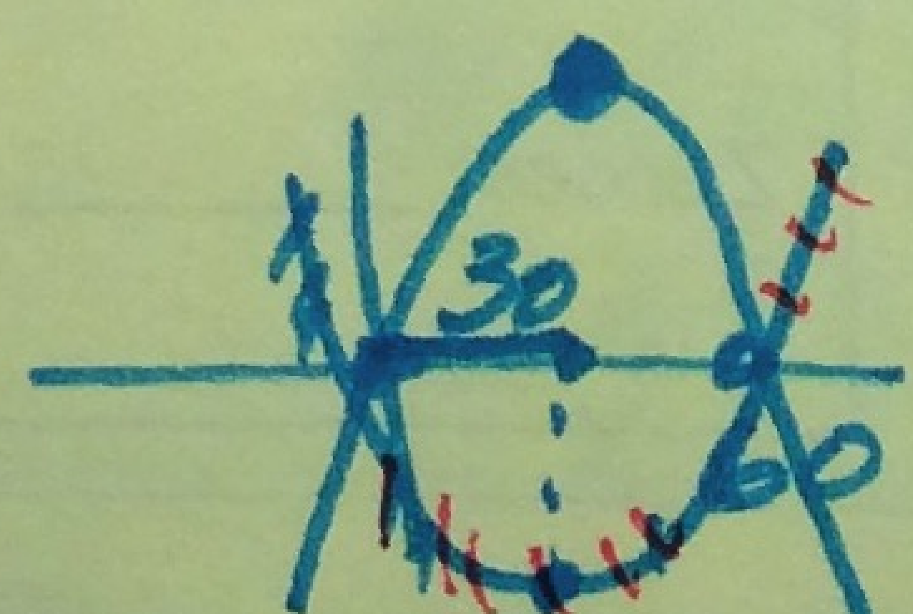
Dim:

$\boxed{30 \times 60}$

$P = 2x + y$

$120 = 2x + y$

$y = 120 - 2x$



Vertex:

$(30, 60)$

$y = 60$

$A = 30(120 - 2(30))$

$\boxed{A = 1800 ft^2}$