Name: Key

7.3 Hyperbolas!

L/R

1) Graph $\frac{(x+1)^2}{4} - (y-3)^2 = 1$. Identify:

h: -1
k: 3
a: 2
b: 1
c: $\sqrt{5}$ or 2.2

$c^2 = a^2 + b^2$
$c^2 = 4 + 1$
$\sqrt{c^2} = \sqrt{5}$

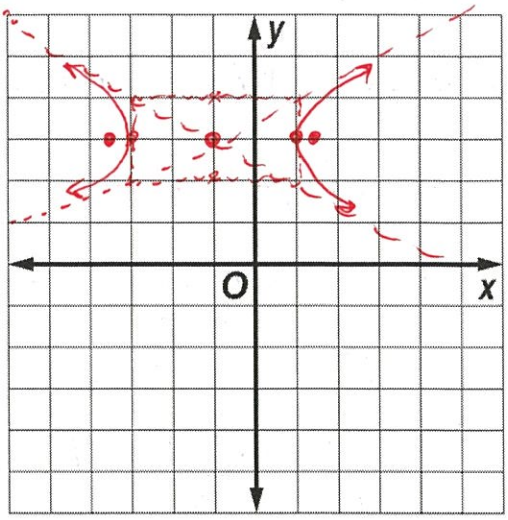
Center: (-1, 3)

Vertices: (1, 3) and (-3, 3)

Foci: (1.2, 3) and (-3.2, 3)

Equation of Asymptotes:

$y - 3 = \pm\frac{1}{2}(x+1)$



Name: Key II

7.3 Hyperbolas!

Horizontal $\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$

1) Graph $\frac{(x+1)^2}{\sqrt{4}} - \frac{(y-3)^2}{\sqrt{1}} = 1$. Identify:

h: -1
k: 3
a: 2
b: 1
c: $\sqrt{5}$ or 2.2

$c^2 = a^2 + b^2$
$c^2 = (2)^2 + (1)^2$
$c^2 = 5$
$c = \sqrt{5}$ or 2.2

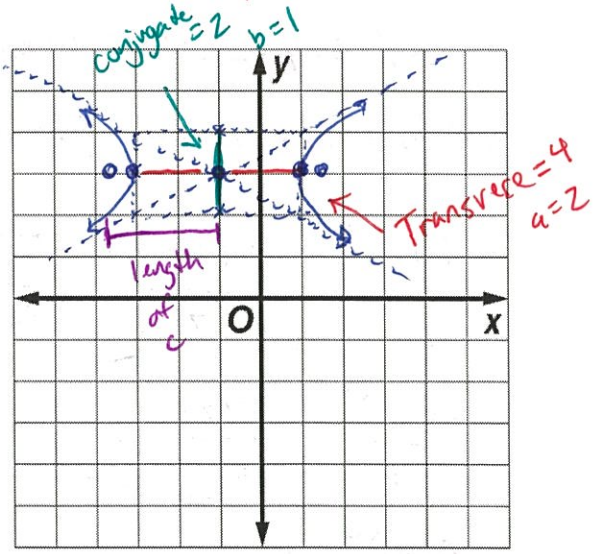
Center: (-1, 3) (h, k)

Vertices: (1, 3) and (-3, 3)

Foci: $(-1 \pm \sqrt{5}, 3)$ or (1.2, 3) (3.2, 3)

Equation of Asymptotes:

$y - 3 = \pm\frac{1}{2}(x+1)$



Vertices
$(h \pm a, k)$
$(h+a, k)$ $(h-a, k)$
$(-1+2, 3)$ $(-1-2, 3)$
$(1, 3)$ $(-3, 3)$

Foci
$(h \pm c, k)$
$(h+c, k)$ $(h-c, k)$
$(-1+\sqrt{5}, 3)$ $(-1-\sqrt{5}, 3)$
or or
$(-1+2.2, 3)$ $(-1-2.2, 3)$
$(1.2, 3)$ $(-3.2, 3)$

Same as in given equation

Equation of Asymptotes
$y - k = \pm\frac{b}{a}(x-h)$
$y - 3 = \pm\frac{b}{a}(x+1)$
$y - 3 = \pm\frac{1}{2}(x+1)$ $\frac{\text{rise}}{\text{run}}$

2) Put $18y^2 - 36y - 8x^2 - 32x - 86 = 0$ in standard form and graph.

÷2 ÷2 ÷2 ÷2 ÷2 ÷2

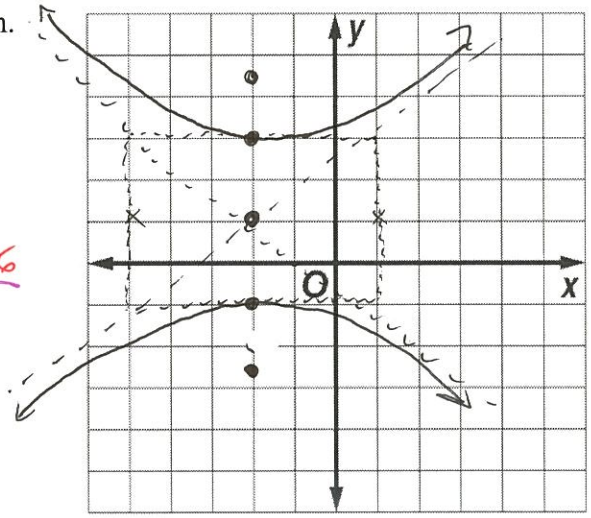
$9y^2 - 18y + \_\_ \; (4x^2 - 16x + \_\_) = 43 + \_\_ + \_\_$

$9(y^2 - 2y + \underline{1}) - 4(x^2 + 4x + \underline{4}) = 43 + \underline{9} + \underline{-16}$

$9(y-1)^2 - 4(x+2)^2 = 36$

÷36 ÷36 ÷36

$$\frac{(y-1)^2}{4} - \frac{(x+2)^2}{9} = 1$$



$c = \sqrt{13}$ or 3.6

+ of $x^2 + y^2$ so 1st!

↓

2) Put $18y^2 - 36y - 8x^2 - 32x - 86 = 0$ in standard form and graph.

$18y^2 - 36y + \_\_ - 8x^2 - 32x + \_\_ = 86 + \_\_ + \_\_$

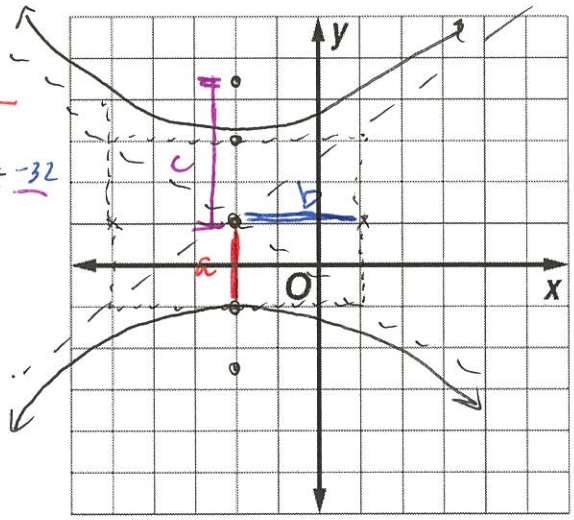
$18(y^2 - 2y + \underline{1}) - 8(x^2 + 4x + \underline{4}) = 86 + \underline{18} + \underline{-32}$

$18(y-1)^2 - 8(x+2)^2 = 72$

÷72 ÷72 ÷72

$$\frac{(y-1)^2}{4} - \frac{(x+2)^2}{9} = 1$$

$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$



a: 2

b: 3

c: $4+9$, $\sqrt{13}$ or 3.6

h: -2

k: 1

Vertices $(h, k \pm a)$

$(-2, 1 \pm 2)$

$(-2, -1)$ $(-2, 3)$

Foci $(h, k \pm c)$

$(-2, 1 \pm \sqrt{13})$

$(-2, -2.6)$ $(-2, 4.6)$

Trans ↕ $x = -2$

Conj ⟺ $y = 1$