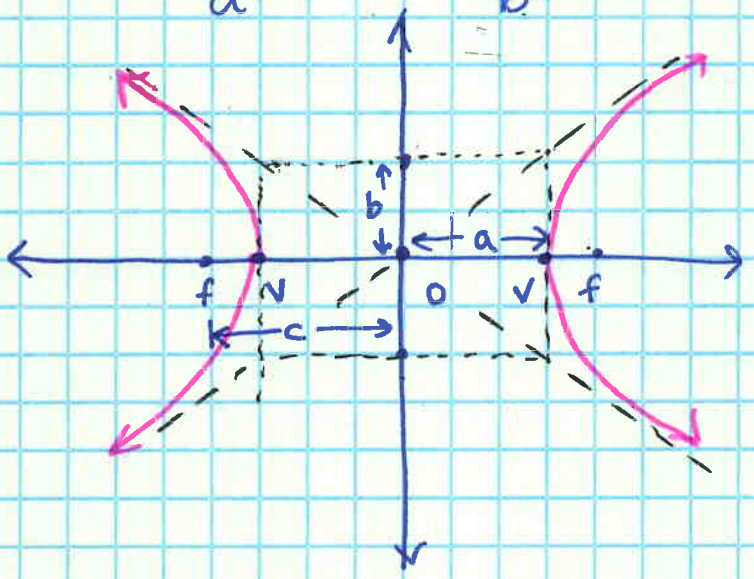
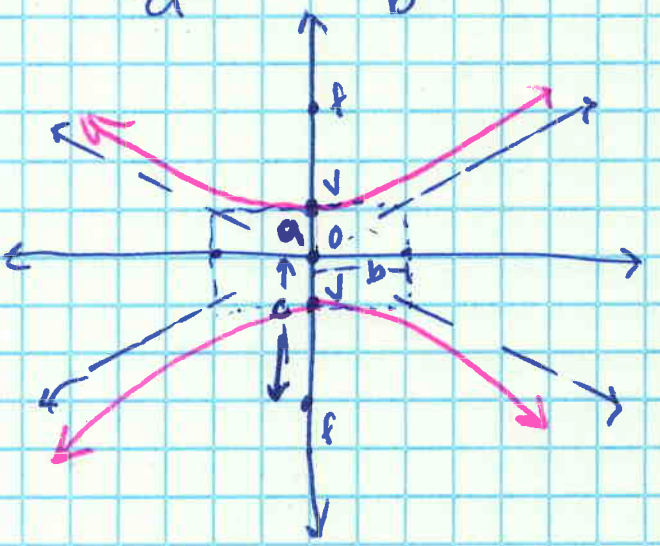
7-3 hyperbolas

Standard Form

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



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



Subtracted terms (ellipse adds)

"a^2" first denominator
first numerator determines orientation

transverse axis: between vertices, through center
$2a$: length between vertices
a: center out

"b^2" second denominator

conjugate axis $\perp$ transverse axis
helps define hyperbolic shape

"c^2" $= a^2 + b^2$ * adding

$2c$ distance between foci
c - center to focus

Asymptotes:

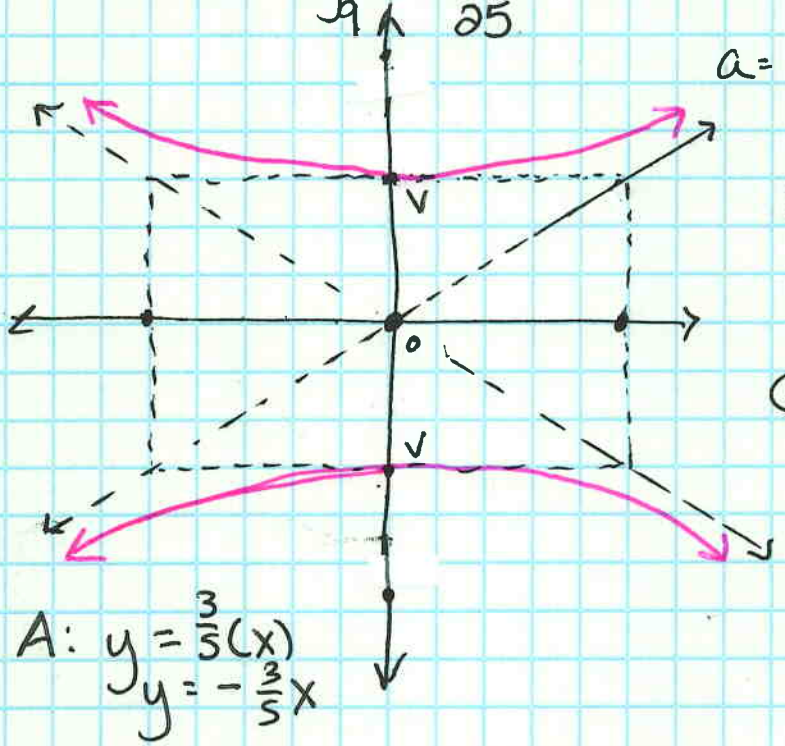
A_h: $y - K = \pm \frac{b}{a}(x-h)$

A_v $y - k = \pm \frac{a}{b}(x-h)$

Ex1 Graphing Hyperbola

a) $\frac{y^2}{9} - \frac{x^2}{25} = 1$ ① orientation vert. ∩∪

$a = 3 \quad b = 5 \quad c = \sqrt{9+25} = \sqrt{34} \approx 5.8$



② center (0, 0)
Vertices (0, −3) (0, +3)
foci (0, −5.8) (0, 5.8)

③ Sketch box 2a × 2b
Sketch asymptotes

④ sketch hyperbola

⑤ find asymptote eqs
pt (0,0) $m = \pm 3/5$

A: $y = \frac{3}{5}(x)$
$y = -\frac{3}{5}x$

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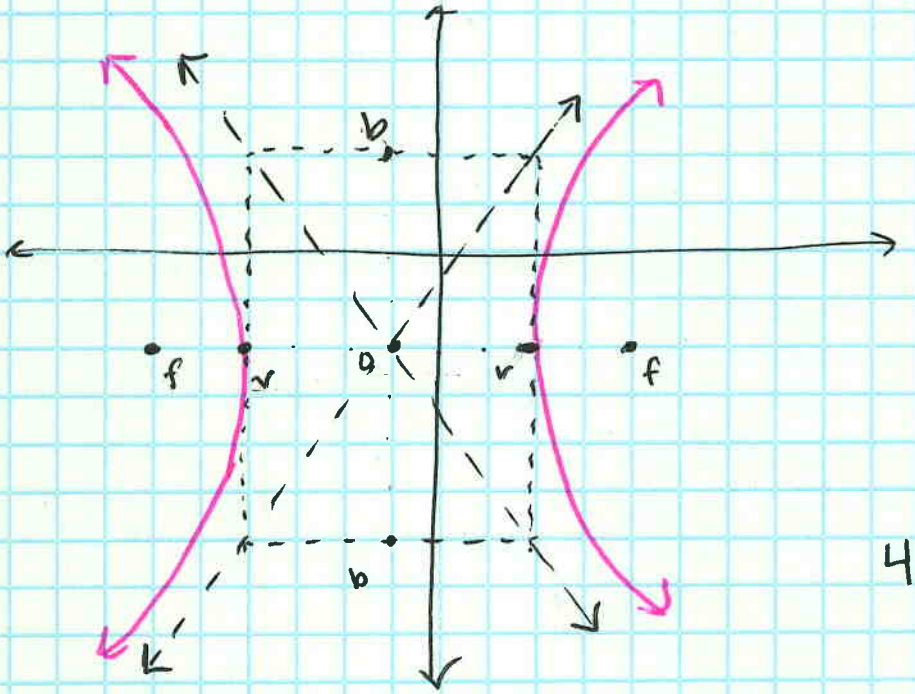
b) $\frac{(x+1)^2}{9} - \frac{(y+2)^2}{16} = 1$ Orientation: horiz. ⟩⟨

$a = 3 \quad b = 4 \quad c = \sqrt{25} = 5$



Center (−1, −2)
Vertices (−4, −2) (2, −2)
foci (−6, −2) (4, −2)

A: (−1, −2) $m = \pm \frac{4}{3}$

$y + 2 = \frac{4}{3}(x+1)$

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

449: 1, 2, 12, 13, 98, 99