Warm-up 6: Hyperbola

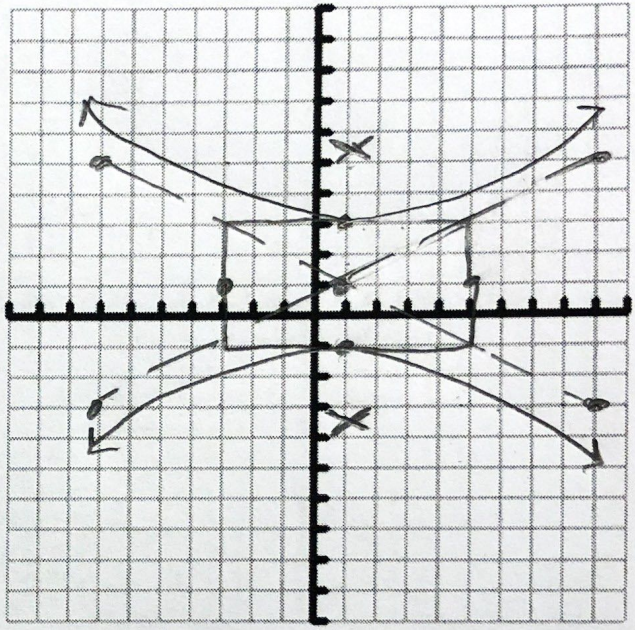
$-x^2 + 4y^2 + 2x - 8y - 13 = 0$

$4y^2 - 8y - x^2 + 2x = 13$

$4(y^2 - 2y + 1) - (x^2 - 2x + 1) = 13 + 4 - 1$

$\frac{4(y-1)^2}{16} - \frac{(x-1)^2}{16} = \frac{16}{16}$

$\frac{(y-1)^2}{4} - \frac{(x-1)^2}{16} = 1$



center = $(1, 1)$

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

foci = $(1, 1 \pm 2\sqrt{5})$

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

$m = \frac{2}{4} = \frac{1}{2}$

Vertical Hyperbola ∩

$a = 2$

$b = 4$

$c^2 = a^2 + b^2$

$c^2 = 4 + 16$

$c^2 = 20$

$c = \pm 2\sqrt{5} \approx 4.5$