

10.5 HYPERBOLAS

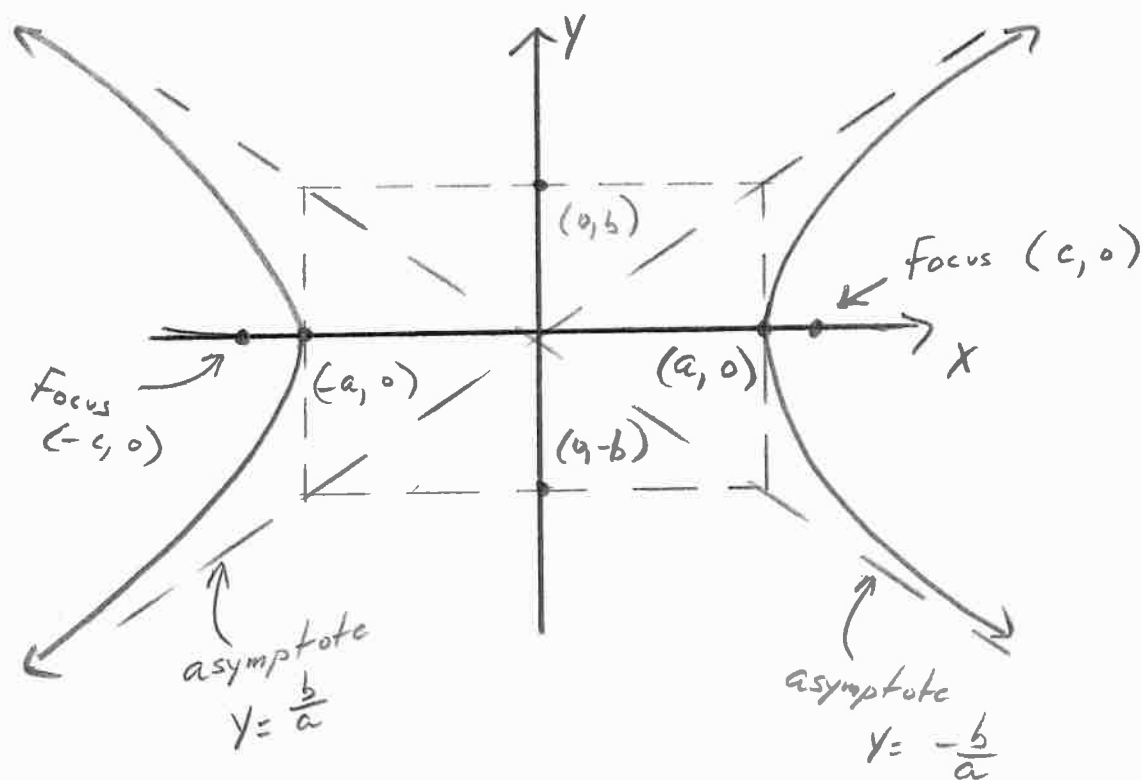
STANDARD FORM: CENTER (h, k)

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

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

NOTES ① a^2 IS LISTED FIRST

② $a^2 + b^2 = c^2$ FOCI ARE c UNITS FROM CENTER



Ex: GRAPH $\frac{(y-3)^2}{25} - \frac{(x-2)^2}{16} = 1$

$a^2 = 25$

$b^2 = 16$

CENTER: $(h, k) = (2, 3)$

$a = 5$

$b = 4$

$c^2 = a^2 + b^2 = 25 + 16$

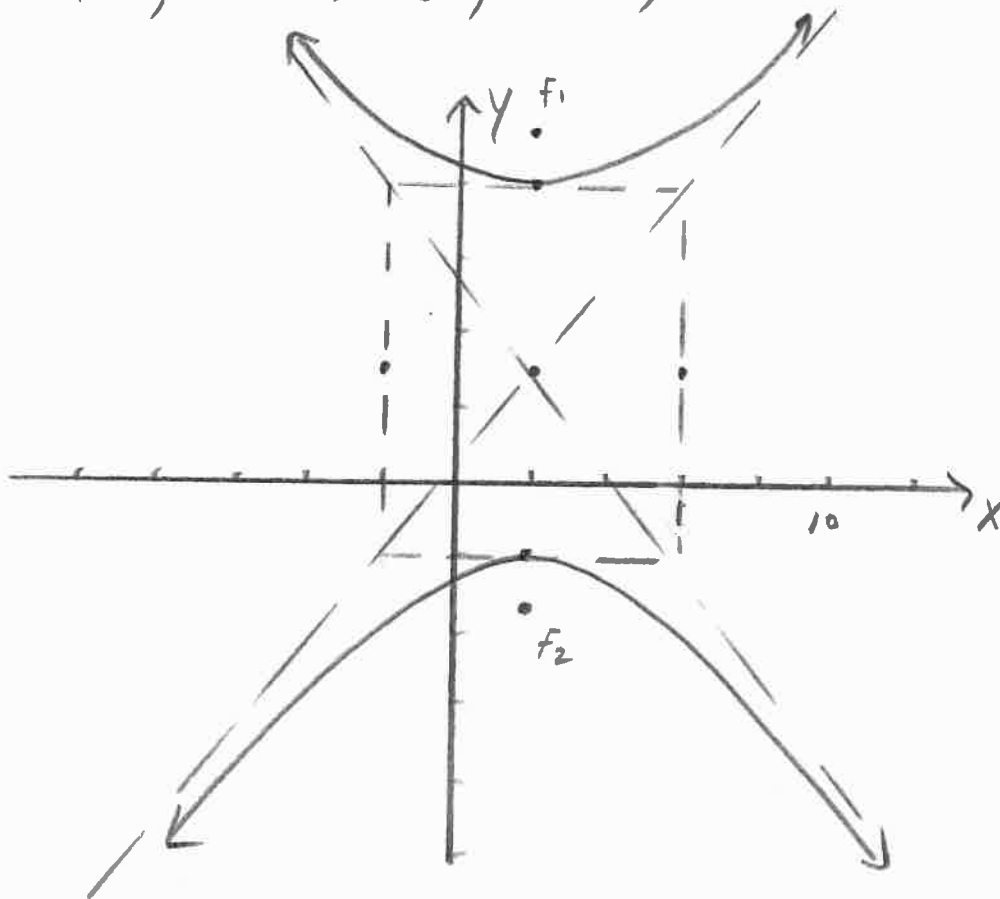
SINCE IT BEGINS WITH

$c^2 = 41$ $c = \sqrt{41}$

$\frac{(y-3)^2}{25}$, IT HAS A

VERTICAL TRANSVERSE AXIS

Foci: $(2, 3 + \sqrt{41})$ $(2, 3 - \sqrt{41})$



Ex: GRAPH $16x^2 + 32x - 4 - 4y^2 + 32y - 8 = 100$

$$16x^2 + 32x - 4y^2 + 32y = 100 + 4 + 8$$

$$16(x^2 + 2x) - 4(y^2 - 8y) = 112$$

$$16(x^2 + 2x + 1) - 4(y^2 - 8y + 16) = 112 + 16 - 64$$

$$16(x+1)^2 - 4(y-4)^2 = 64$$

$$\frac{16(x+1)^2}{64} - \frac{4(y-4)^2}{64} = 1$$

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

Center $(-1, 4)$

$$a^2 = 4 \quad a = 2$$

$$b^2 = 16 \quad b = 4$$

$$c^2 = a^2 + b^2 = 4 + 16 = 20$$

$$c = \sqrt{20} = 2\sqrt{5}$$

