Example 1 Hyperbolas p. 8 Ch 11

a) Opens up/down or left/right?

$$\frac{y^2}{9} - \frac{x^2}{16} = 1$$

- This Hyperbola opens up/down since the y^2 is positive & x^2 is negative

$$\frac{y^2}{9} - \frac{x^2}{16} = 1$$

- Get a, b & c
- a^2 is the positive denominator

  so, $a^2 = 9$ so, $a = 3$
- b^2 is the negative denominator

  so, $b^2 = 16$ so, $b = 4$
- $c^2 = a^2 + b^2$

  so, $c = \sqrt{c^2} = \pm\sqrt{9 + 16} = \pm\sqrt{25} = \pm 5$

  so, $c = \pm 5$

b) Give the Vertices

- The vertices are (0, a) & (0, -a) since this hyperbola opens up/down

$V_1(0, 3)$ & $V_2(0, -3)$

b) Find the Foci

- Use c to give the foci. For an hyperbola which opens up/down (y^2 term is positive) the foci will be $F_1(0, c)$ & $F_2(0, -c)$

So, $F_1(0, 5)$ & $F_2(0, -5)$

c) Find the Asymptotes

- The asymptotes tells us what values the function will approach but never reach and are given by $y = {}^{a}/_{b}\, x$ and $y = -{}^{a}/_{b}\, x$ when the y^2 term is positive.

So, $y = {}^{3}/_{4}\, x$ & $y = -{}^{3}/_{4}\, x$

Find the 4 points that Form Central Box

- These 4 points lie on the asymptotes and are (-b, a) & (-b, -a) & (b, a) & (b, -a) when the hyperbola opens up/down

(-4, 3) & (-4, -3) & (4, 3) & (4, -3)

e) Sketch the graph

- 1st Place the vertices
- 2nd Place the foci
- 3rd Draw the asymptotes
- 4th Place the 4 points

  that make the central box
- 5th Draw the hyperbola