Example 2 Hyperbolas p. 8 Ch 11

$$9x^2 - 4y^2 = 36$$

- 1st the constant must be 1, so divide all terms by 36

$$\frac{9x^2}{36} - \frac{4y^2}{36} = \frac{36}{36}$$

So,

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

a) Opens up/down or left/right?

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

- This Hyperbola opens left/right since the x^2 is positive & y^2 is negative

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

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

  so, $a^2 = 4$ so, $a = 2$
- b^2 is the negative denominator

  so, $b^2 = 9$ so, $b = 3$
- $c^2 = a^2 + b^2$

  so, $c = \sqrt{c^2} = \pm\sqrt{4 + 9} = \pm\sqrt{13} \approx \pm 3.6$

  so, $c = \pm 3.6$

b) Give the Vertices

- The vertices are $V_1(-a, 0)$ & $V_2(a, 0)$ since this hyperbola opens left/right

$V_1(-2, 0)$ & $V_2(2, 0)$

b) Find the Foci

- Use c to give the foci. For an hyperbola which opens left/right (x² term is positive) the foci will be $F_1(-c, 0)$ & $F_2(c, 0)$

So, $F_1(-\sqrt{13}, 0)$ & $F_2(\sqrt{13}, 0)$

c) Find the Asymptotes

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

So, $y = {}^{3}/_{2}\, x$ & $y = -{}^{3}/_{2}\, x$

Find the 4 points that Form Central Box

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

(-2, 3) & (-2, -3) & (2, 3) & (2, -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