

KEY

No calculator! Have fun!

For each of the following equations:

- 1) Put the equation into standard form and determine the type of conic section.
- 2) Sketch the graph of the equation.
- 3) Find the foci (or focus and directrix for parabolas) and the eccentricity. For hyperbolas, find the equations of the asymptotes.

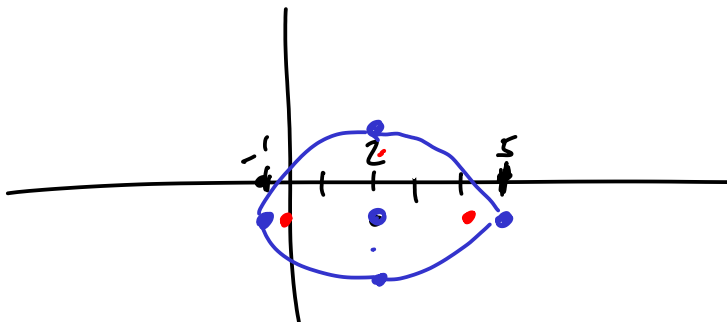
1. $4x^2 - 16x + 9y^2 + 18y - 11 = 0$

$$4(x^2 - 4x + 4) + 9(y^2 + 2y + 1) = 11 + 16 + 9$$

$$4(x-2)^2 + 9(y+1)^2 = 36$$

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

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



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

$$e = \frac{\sqrt{5}}{3}$$

2. $-9x^2 + 18x + 16y^2 - 153 = 0$

$$16y^2 - 9(x^2 - 2x + 1) = 153 - 9$$

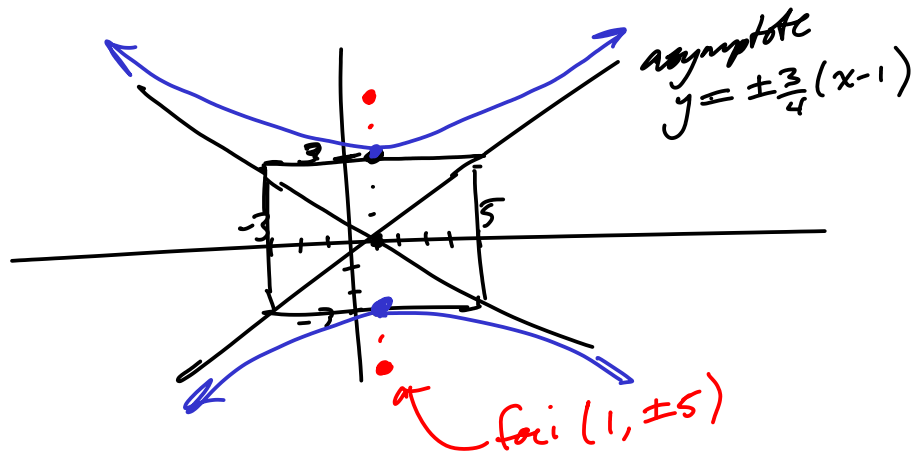
$$16y^2 - 9(x-1)^2 = 144$$

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

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

$$= 25$$

$$c = 5$$



3. $x + y^2 + 4y + 2 = 0$

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

$$= -(y^2 + 4y + 4) - 2 + 4$$

$$= -(y+2)^2 + 2$$

$$x - 2 = -(y+2)^2$$

$$p = \frac{1}{4}$$

focus
 $(2 - \frac{1}{4}, -2)$

