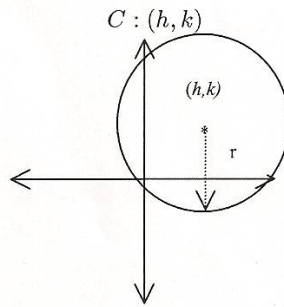


## Summary of the Conic Sections

### Circles

$$(x - h)^2 + (y - k)^2 = r^2$$



radius :  $r$

### Parabolas

case 1: axis of symmetry vertical

$$(y - k) = \frac{1}{4p}(x - h)^2$$

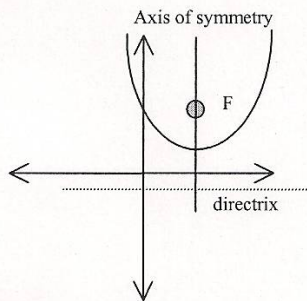
$$D : y = k - p$$

$$V : (h, k)$$

$$A : x = h$$

$$F : (h, k + p)$$

$$e = 1$$



case 2: axis of symmetry horizontal

$$(x - h) = \frac{1}{4p}(y - k)^2$$

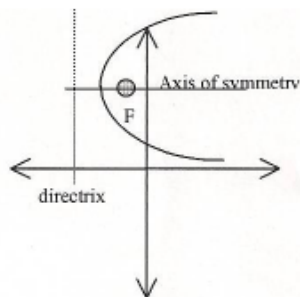
$$D : x = h - p$$



$$V : (h, k)$$

$$A : y = k$$

$$F : (h + p, k)$$

$$e = \frac{c}{a}$$



Note: parabolas open negatively  or  when  $p < 0$ .

## Summary of the Conic Sections

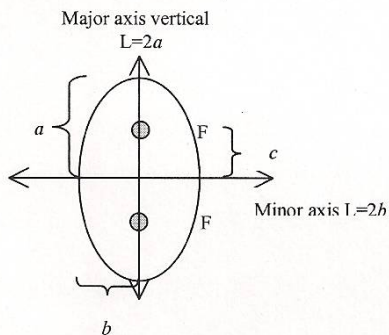
### Ellipses

case 1: Major axis vertical

$$\frac{(y-k)^2}{a^2} + \frac{(x-h)^2}{b^2} = 1$$

Vertices :  $(h, k \pm a)$

Directrix :  $y = \pm a/e$



C :  $(h, k)$

Foci :  $(h, k \pm c)$

case 2: Major axis horizontal

$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$

Vertices :  $(h \pm a, k)$

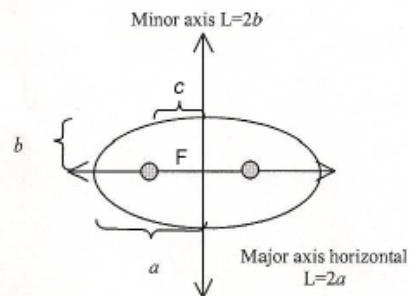
Directrix :  $x = \pm a/e$

$$c^2 = a^2 - b^2$$

Major axis length =  $2a$

eccentricity :  $e = \frac{c}{a}$

minor axis length =  $2b$



C :  $(h, k)$

Foci :  $(h \pm c, k)$

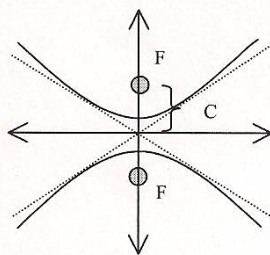
### Hyperbolas

case 1: Transverse axis vertical

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

Vertices :  $(h, k \pm a)$

asymptotes :  $y = k \pm \frac{b}{a}(x - h)$



C :  $(h, k)$

Foci :  $(h, k \pm c)$

Directrix :  $y = \pm a/e$

case 2: Transverse axis horizontal

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

Vertices :  $(h \pm a, k)$

asymptotes :  $y = k \pm \frac{b}{a}(x - h)$

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

eccentricity :  $e = \frac{c}{a}$

C :  $(h, k)$

Foci :  $(h \pm c, k)$

Directrix :  $x = \pm a/e$

