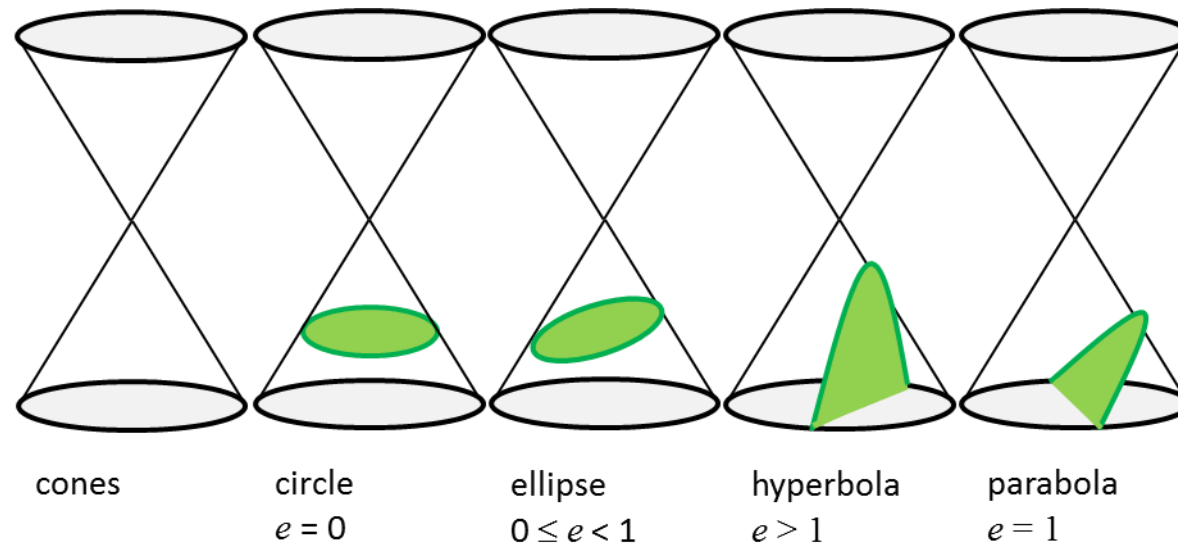# ADVANCED HIGH SCHOOL MATHEMATICS

CONICS

CONIC SECTIONS

Taking different slices through a cone you can create a circle, an ellipse, a parabola and a hyperbola.

| cones | circle $e = 0$ | ellipse $0 \leq e < 1$ | hyperbola $e > 1$ | parabola $e = 1$ |

Theses conic sections are defined using a straight line (**directrix** $y = -a$) and a point (**focus** $F(0, a)$) where a is the conic section parameter.

Consider any point $P(x_P, y_P)$ on the conic

section and the point $D(x_P, -a)$ on the

directrix. The distances of these two points

from the focus $F(0, a)$ are d_{FP} and d_{DP} .

The ratio d_{FP}/d_{DP} is called the **eccentricity** e

and is a constant for all conic sections

eccentricity $e = d_{FP}/d_{DP}$

Ellipse $0 \leq e < 1$

Hyperbola $e > 1$

Parabola $e = 1$

parabola
$e = 1$

ellipse
$e = 0.6$

circle
$e = 0$

$F(0, a)$

d_{FP}

$P(x_P, y_P)$

d_{DP}

hyperbola
$e = 2$

directrix
$e = \infty$

$D(x_P, -a)$

$e = d_{FP}/d_{DP} = \text{constant}$