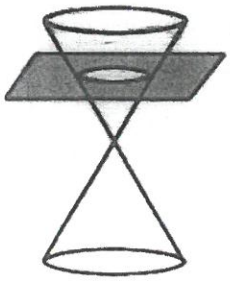
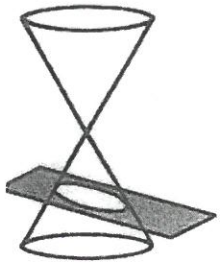


Circle

Chapter 12 Conic Sections
Section 12-2 Circle and Ellipse



Ellipse

Def: the set of all points equidistant from a center point

Unit circle $x^2 + y^2 = 1$

center (0,0)

radius = 1

Translations change the center point

$(x-2)^2 + (y+3)^2 = 1$

center (2,-3)

r = 1

Dilations change the radius

$\left(\frac{x+3}{5}\right)^2 + \left(\frac{y-1}{5}\right)^2 = 1$

Center (-3,1)

radius = 5

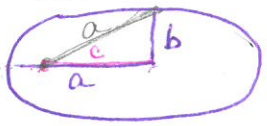
Def: the set of all points such that the *sum* of the distances from two points (called foci) is constant

x^2 and y^2 have same sign
but x and y dilations are different
(x radius and y radius)

- longer radius is called **major radius** (a)
- shorter radius is called **minor radius** (b)
- foci (c) are on the major axis

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

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



Standard form of an ellipse.

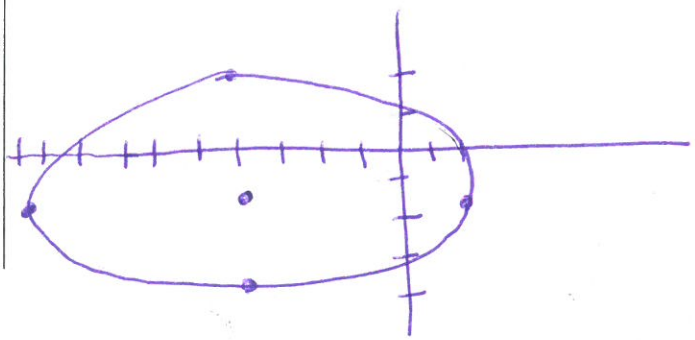
$$\left(\frac{x}{3}\right)^2 + \left(\frac{y}{5}\right)^2 = 1$$

x radius = 3
y radius = 5
center (0,0)

Graph

$$\left(\frac{x+4}{6}\right)^2 + \left(\frac{y+1}{3}\right)^2 = 1$$

center (-4,-1) x rad = 6 y rad = 3



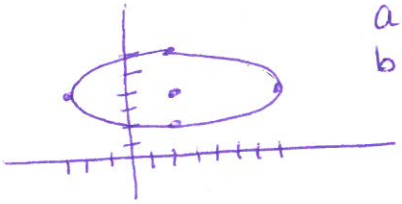
from a point

The distance from the focus is directly proportional to its distance from the directrix. This proportionality constant is called the **eccentricity.** "e"
The closer e is to 0, the rounder the ellipse is ($e = 0$ is a circle)
For an ellipse, $0 < e < 1$ The closer it is to 1, the longer and more "eccentric" the ellipse is.

$$e = \frac{c}{a} = \frac{focal\ radius}{major\ radius}$$

Circle or Ellipse? If it's an ellipse, find e.

1. $\left(\frac{x-2}{5}\right)^2 + \left(\frac{y-4}{2}\right)^2 = 1$ ellipse

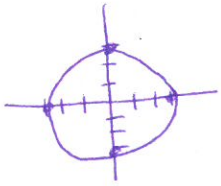


$a = 5$ $5^2 = 2^2 + c^2$
$b = 2$ $c = \sqrt{21}$

$e = \frac{\sqrt{21}}{5}$

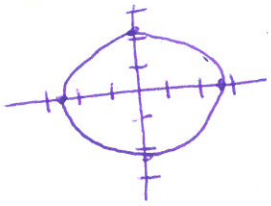
2. $\frac{x^2}{9} + \frac{y^2}{9} = 1$ circle $e = 0$

$\left(\frac{x}{3}\right)^2 + \left(\frac{y}{3}\right)^2 = 1$



3. $\frac{5x^2}{35} + \frac{7y^2}{35} = \frac{35}{35}$ ellipse

$\frac{x^2}{7} + \frac{y^2}{5} = 1$



$\left(\frac{x}{\sqrt{7}}\right)^2 + \left(\frac{y}{\sqrt{5}}\right)^2 = 1$

$a = \sqrt{7}$ $(\sqrt{7})^2 = (\sqrt{5})^2 + c^2$
$b = \sqrt{5}$

$\sqrt{2} = c$ foci $(0 \pm \sqrt{2}, 0)$

$e = \frac{\sqrt{2}}{\sqrt{7}}$

4. $\frac{3x^2}{12} + \frac{3y^2}{12} = \frac{12}{12}$ circle $e = 0$

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

$\left(\frac{x}{2}\right)^2 + \left(\frac{y}{2}\right)^2 = 1$