

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=195>



Circle - all points in a plane

equidistant from the center

Standard form of the equation of a circle -

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

Center (h, k)

Radius $= r$

Ex 1 Sketch the conic section given by the equation

$$\left(\frac{y}{2}\right)^2 + (x-h)^2 + (y-k)^2 = r^2$$

$$x^2 - 6x + y^2 + 2y - 6 = 0$$

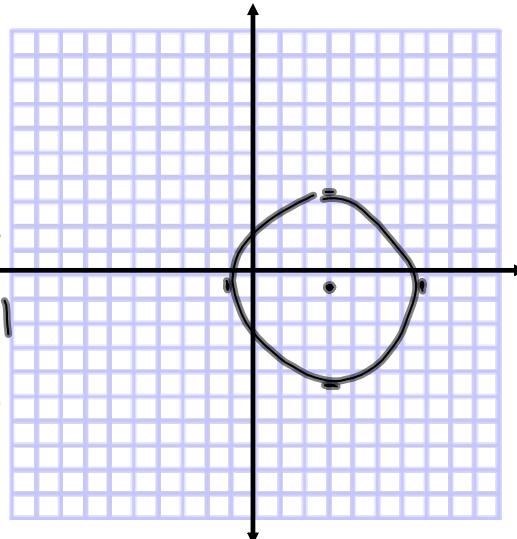
$$x^2 - 6x + y^2 + 2y = 6$$

$$x^2 - 6x + \underline{9} + y^2 + 2y + \underline{1} = 6 + 9 + 1$$

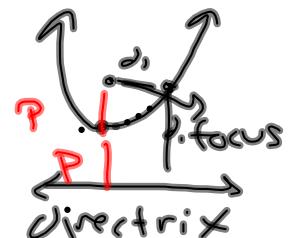
$$(x-3)^2 + (y+1)^2 = 16$$

Center: $(3, -1)$

radius: 4



Parabola - all points in a plane are equidistant from a point and a line



Standard form of the equation of a parabola -

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

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

vertex: (h, k)

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

a is the distance from the vertex to the focus

Ex 2 Sketch the conic section given by the equation

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

$$x^2 - 4x + 4y + 8 = 0$$

$$x^2 - 4x = -4y - 8$$

$$x^2 - 4x + \underline{4} = -4y - 8 + 4$$

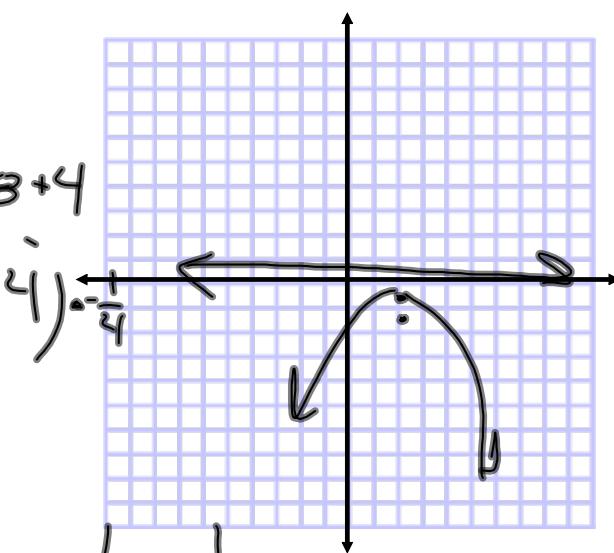
$$-\frac{1}{4}(x-2)^2 = (-4(y+1)) - \frac{1}{4}$$

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

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

$$\text{Vertex } (2, -1)$$

$$\text{Focus } (2, -2)$$



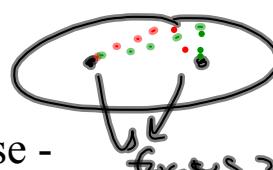
$$-\frac{1}{4} = \frac{1}{4}$$

$$P = -1$$

$$\text{Directrix } y = 0$$

Ellipse -

a set of all points in a plane
whose distance to two points
is equal



Standard form of the equation of an ellipse -

foci points

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

Center (h, k)

a : Stretch in x -direction

b : Stretch in y -direction

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

c - distance to foci

Ex 3 Sketch the conic section given by the equation

$$25x^2 - 200x + 9y^2 + 54y + 256 = 0$$

$$25x^2 - 200x + 9y^2 + 54y = -256$$

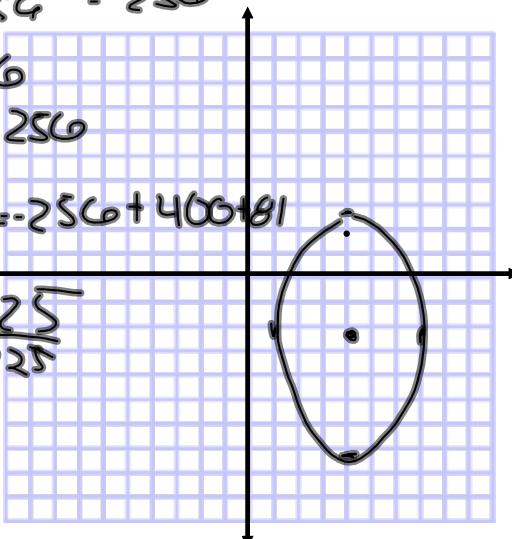
$$25(x^2 - 8x) + 9(y^2 + 6y) = -256$$

$$25(x^2 - 8x + \frac{16}{25}) + 9(y^2 + 6y + \frac{9}{25}) = -256 + 400 + 81$$

$$\frac{25(x-4)^2}{225} + \frac{9(y+3)^2}{225} = 1$$

$$\frac{(x-4)^2}{3^2} + \frac{(y+3)^2}{5^2} = 1$$

$$\text{Center} = (4, -3)$$



Homework

p.667

#1-31, 43-61, 75-79 odds

p.687

#1-15, 23-25, 31-33 odds