Section 10.1 – The Distance and Midpoint Formulas Revisited

Goals:

1. To find the distance between two points in the coordinate plane.
2. To find the midpoint of a line segment in the coordinate plane.

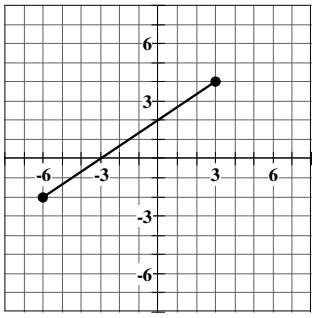
I. Midpoint Formula

B. Formula:

C. Example: Find the center of the circle with diameter whose endpoints are (5,2) and (7,8).

II. Distance Formula:

B. Find the length of the segment.



C. Formula:

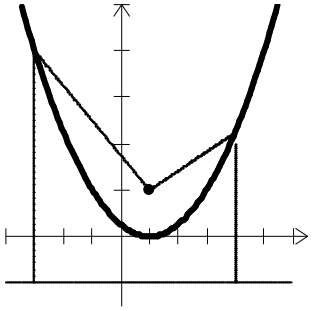
D. Examples:

1. Matt's disc is 3 feet short and 2 feet to the right of the basket. On his first putt the disc lands 4 feet beyond the basket and 1 foot to the left. If the disc went in a straight line, how far did it go?

2. A coordinate grid is placed over a scale drawing of Nita's patio. A grill is located at (2, –3). A flowerpot is located at (–6, –1). A picnic table is halfway between the grill and the flowerpot. In coordinate units, about how far is it from the grill to the picnic table?

Homework: p. 619 – 1-9 all, 51-63 all

Section 10.2 – Parabolas



Goals:
1. To write equations of parabolas.
2. To graph parabolas from given information.

I. Definitions

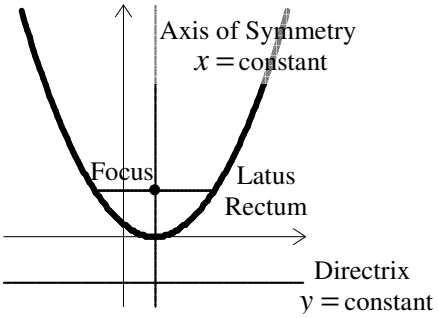
A. Parabola – set of all _____ in a _____ that are the same _____ from a given _____ and a given _____ .
(http://www.ies.co.jp/math/java/conics/draw_parabola/draw_parabola.html)

B. _____ – the given point.

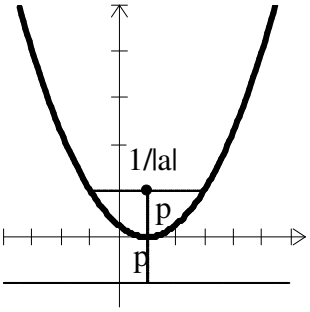
C. _____ – the given line.

D. _____ _____ – the line segment through the focus perpendicular to the axis of symmetry.

E. Property of Reflection
(http://www.ies.co.jp/math/java/conics/focus/focus.html)

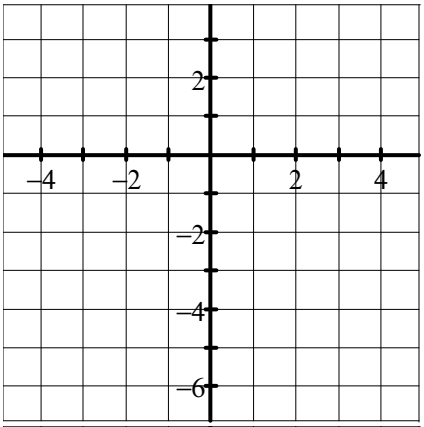


II. Parabolic Information
See Conic Section cheat sheet

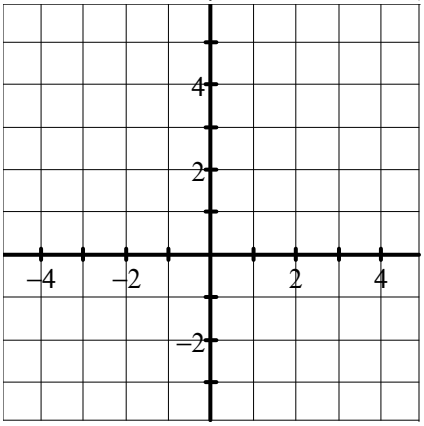


B. Examples

1. Graph: $y = 2(x-1)^2 - 5$
Give all info.



2. Graph: $x + y^2 = 4y - 1$
Give all info



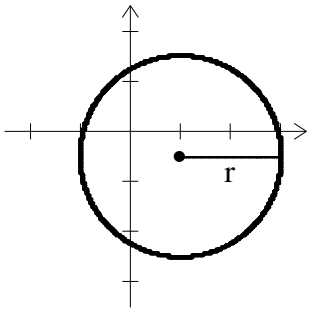
3. Write an equation for a cross section of a satellite dish with a vertex (8, 6) and focus (2, 6).

4. Write an equation for the parabola whose focus is at (1,3) and directrix is $x = 7$.

Homework: p. 627 – 1-13 all, 39, 46-50 all

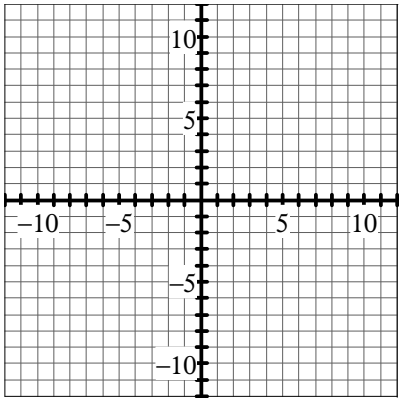
Section 10.3 – Circles

Goals:
1. To write equations of circles.
2. To graph circles having certain properties.



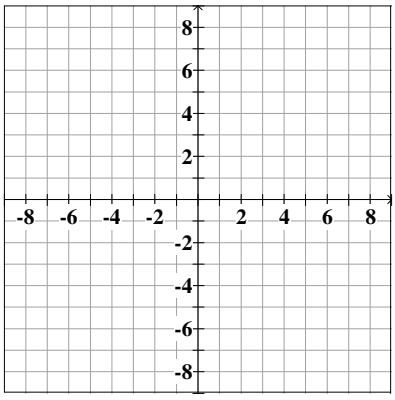
I. Definitions
   A. Circle – the set of all _____ in a _____ equidistant from a given _____, _____.
   B. _____ – any segment whose _____ are the center of the circle and a _____ on the circle.

II. Circle Information
   See Conic Section cheat sheet



   B. Examples
      1. Find the center and radius of the circle and graph:
         a) $x^2 + (y-3)^2 = 49$

         b) $x^2 + y^2 + 6x - 7 = 0$



         c) $x^2 + y^2 + 8x - 4y + 11 = 0$

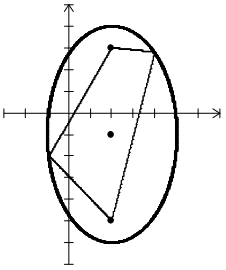
      2. The plan for a park puts the center of a circular pond of radius 0.6 mile at 2.5 miles east and 3.8 miles south of the park headquarters. Write an equation to represent the border of the pond, using the headquarters as the origin.

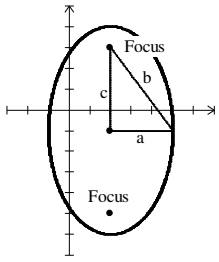
      3. Write an equation of a circle if the endpoints of a diameter are at (2,8) and (2,-2).

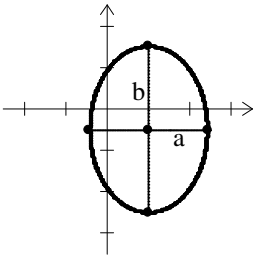
Homework: p. 634 – 1-11 all, 43, 45, 51-55 odds, 72

Section 10.4 – Ellipses

Goals:
1. To write equations of ellipses.
2. To draw an ellipse having certain properties.







I. Definitions

A. Ellipse – the set of all _____ in a _____ such that the _____ of the _____ from any point on the _____ and two given points in a _____, _____, is constant.

B. Two axes of symmetry
   1. _____ axis – longer axis
   2. _____ axis – shorter axis

C. _____ – location where the two _____ of _____ intersect.

D. _____ – location where the _____ of _____ intersect the ellipse.

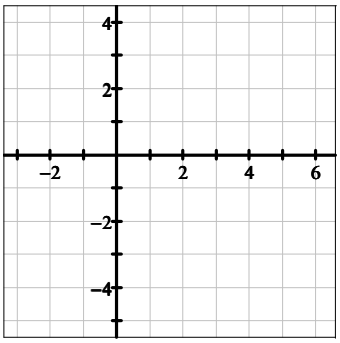
E. Reflection Properties
(http://www.ies.co.jp/math/java/conics/focus_ellipse/focus_ellipse.html)

II. Ellipse Information
See Conic Section cheat sheet

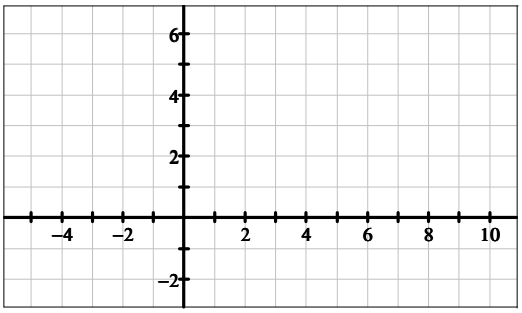
B. Examples

1. Graph and find all information about ellipse:

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

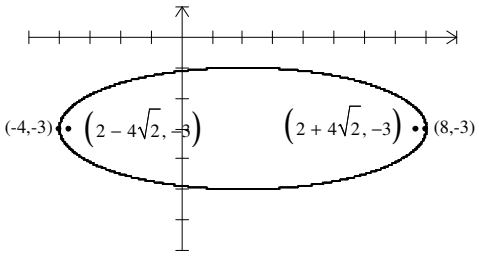


b) $x^2+4y^2-6x-16y-11=0$



2. Write an equation for the ellipse with vertices at (–6, –2) and (4, –2) and co-vertices at (–1, –4) and (–1, 0).

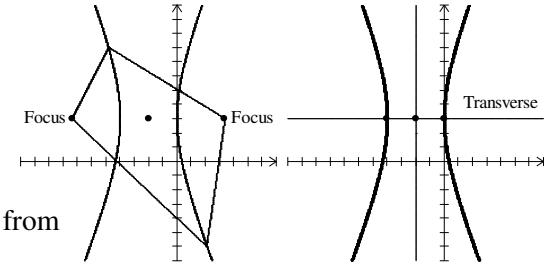
3. A Write an equation for the ellipse



Homework: p. 643 – 1-10 all, 14, 19, 33, 37, 40, 53, 55, 59

Section 10.5 – Hyperbolas

Goals:
1. To write equations of hyperbolas.
2. To draw a hyperbola having certain properties.



I. Definitions

A. Hyperbola – the set of all points in a plane such that the _____ value of the _____ of the distances from any point on the hyperbola and any two given points in a plane, _____, is constant.

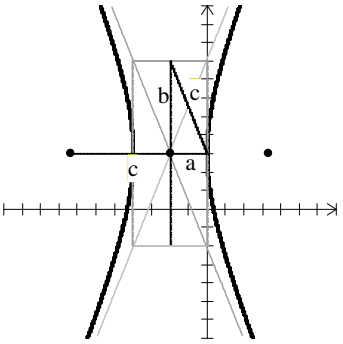
B. Two axes of symmetry
   1. _____ axis – axis goes through the _____.
   2. _____ axis – _____ to the transverse axis

C. _____ – location where the two axes of symmetry intersect.

D. _____ – location where the transverse axes of symmetry intersect the hyperbola.

E. _____ – boundary lines.

F. Reflection Properties
(http://www.ies.co.jp/math/java/conics/focus_hyper/focus_hyper.html)

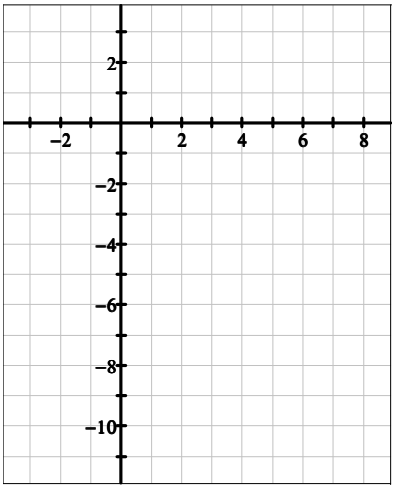


II. Hyperbola Information
See Conic Section cheat sheet

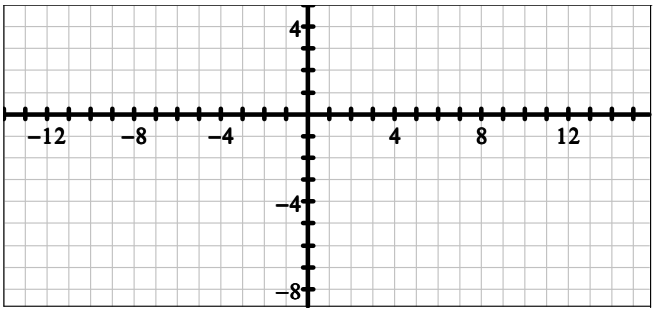
B. Examples

1. Graph and find all information about hyperbola:

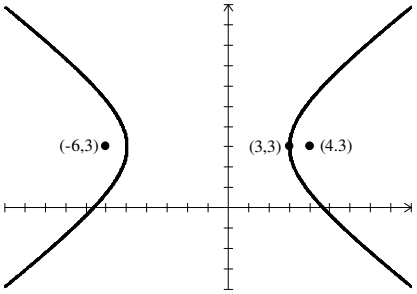
a) $\frac{(x-3)^2}{4} - \frac{(y+5)^2}{9} - = 1$



b) $9y^2 - x^2 + 54y + 4x + 41 = 0$



2. A Write an equation for the hyperbola



Homework: p. 652 – 1-8 all, 10-13 all, 25-30 all, 32, 39, 44, 61, 64

Section 10.6 – Conic Sections
Conic Sections Cheat Sheet

Conic Section

- **Parabola**

• Equations	$y = a(x-h)^2 + k$		$x = a(y-k)^2 + h$
• Vertex	(h, k)		(h, k)
• Axis of Symmetry	$x = h$		$y = k$
• $a > 0$			
• Opening	upward		right
• Focus	$(h, k+p)$	$*p = \frac{1}{4\lvert a\rvert}$	$(h+p, k)$
• Directrix	$y = k - p$		$x = h - p$
• a < 0		*p is the distance from the vertex to the focus or directrix	
• Opening	downward		left
• Focus	$(h, k-p)$		$(h-p, k)$
• Directrix	$y = k + p$		$x = h + p$
• Latus Rectum	$\frac{1}{\lvert a\rvert}$		$\frac{1}{\lvert a\rvert}$

- **Circle**
  - Equation: $(x-h)^2 + (y-k)^2 = r^2$
  - Center: (h,k)
  - Radius: r

- Ellipse
  - Equation: $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$
  - Center: (h,k)
  - Vertices: $(h \pm a, k)$ and $(h, k \pm b)$
  - If $a > b$
    - axis length: $2b$ (minor axis); $2a$ (major axis)
    - Focus: "c" is distance from center; $c^2 = a^2 - b^2$; $(h \pm c, k)$
  - If $b > a$
    - axis length: $2b$ (major axis); $2a$ (minor axis)
    - Focus: "c" is distance from center; $c^2 = b^2 - a^2$; $(h, k \pm c)$

Conic Section

• **Hyperbola**		
• Equations	$-\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$	$\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=1$
• Center	(h, k)	(h, k)
• Vertex	$(h, k \pm b)$	$(h \pm a, k)$
• Opens	Up and Down	Right and Left
• Foci	"c" is distance from the center $c^2 = a^2 + b^2$ $(h, k \pm c)$	"c" is distance from the center $c^2 = a^2 + b^2$ $(h \pm c, k)$
• Asymptotes	$y = \pm\frac{b}{a}x + (y\text{-intercept})$	$y = \pm\frac{b}{a}x + (y\text{-intercept})$

	1st and 3rd Quadrants	**2nd and 4th Quadrants**
• **Special Hyperbola**	$xy = c$	$xy = -c$
• Center	(0,0)	(0,0)
• Points on the graph	(c,1), (1,c), (-1,-c), and (-c,-1)	(-c,1), (1,-c), (-1,c), and (c,-1)
• Asymptotes	x - and y - axis	x - and y - axis

Conic Equation:

$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$$

Type of Conic by analyzing
A and C with $B = 0$

Conic Section	Relationship of A and C
Parabola	$A = 0$ or $C = 0$, but not both.
circle	$A = C$
ellipse	$A \neq C$ but signs are same
hyperbola	A and C have opposite signs
Line	$A = 0$ and $C = 0$

Homework: p.659 – 1-13 all, 27, 35-37, 56, 57, 59

Section 10.7 – Solving Nonlinear Systems

Goals:

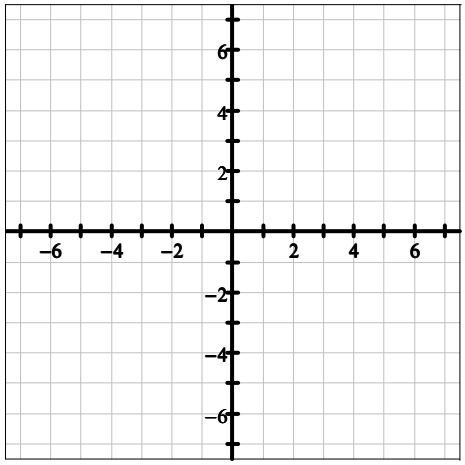
1. To solve nonlinear systems of equations both graphically and algebraically.
2. To solve nonlinear systems of inequalities.

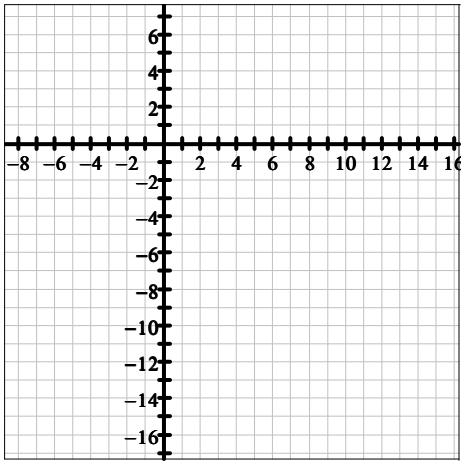
A. Graphically

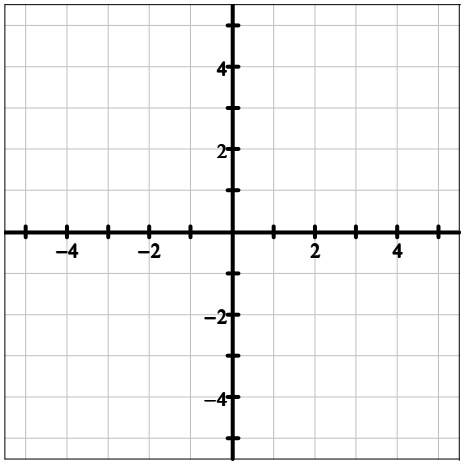
1. $y = (x-2)^2 + 1$
   $y = -x + 5$

2. $10 \geq (x-5)^2 + 2y$
   $y \geq -2x + 9$

3. $x^2 + y^2 > 9$
   $y < |x+1| + 1$







B. Algebraically

1. $x^2 + y^2 = 9$
   $4x^2 + y^2 = 16$

2. $4y = 36 - x^2$
   $x^2 - y^2 = 24$

Homework: p. 664 – 1-8 all, 10-13 a1l, 65-67 all