Day 2

Tuesday, November 28, 2017
4:16 PM

5-Minute Check (over Lesson 7-1)

Use with Lesson **7-2**

Write each equation in standard form. Identify the vertex, focus, axis of symmetry, and directrix.

1. $y^2 - 6y - 4x + 17 = 0$

$y^2 - 6y = 4x - 17$
$(y-3)^2 = 4x - 17 + 9$
$(y-3)^2 = 4x - 8$
$(y-3)^2 = 4(x-2)$

$4p = 4$
$p = 1$

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

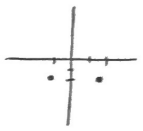
$x^2 + 8x = 4y - 8$
$(x+4)^2 = 4y - 8 + 16$
$(x+4)^2 = 4y + 8$
$(x+4)^2 = 4(y+2)$

$4p = 4$
$p = 1$

Write an equation for a parabola with the given focus *F* and vertex *V*.

3. $F(2, -5)$, $V(2, -3)$ — x^2 (vertical)

4. $F(2, -2)$, $V(-1, -2)$ — y^2 (horizontal)



Standardized Test Practice

5. Which of the following equations represents a parabola with focus $(-3, 7)$ and vertex $(-3, 2)$? x^2, $p = 5$

A $(x + 3)^2 = 5(y - 2)$

B $(y + 3)^2 = 5(x - 2)$

C $(x + 3)^2 = 20(y - 2)$

D $(y - 2)^2 = 20(x + 3)$

$(x+3)^2 = 4p(y-2)$
$(x+3)^2 = 20(y-2)$

1. vertex $(2, 3)$
aos $y = 3$
focus $(3, 3)$
directrix $x = 1$

2. vertex $(-4, -2)$
aos $x = -4$
focus $(-4, -1)$
directrix $y = -3$

3. $(x-2)^2 = 4p(y+3)$
$p = -2$
$(x-2)^2 = -8(y+3)$

4. $(y+2)^2 = 4p(x+1)$
$p = 3$
$(y+2)^2 = 12(x+1)$

ANSWERS

1. $(y - 3)^2 = 4(x - 2)$; vertex: (2, 3), focus: (3, 3), axis of symmetry: $y = 3$, directrix: $x = 1$
2. $(x + 4)^2 = 4(y + 2)$; vertex: $(-4, -2)$, focus: $(-4, -1)$, axis of symmetry: $x = -4$, directrix: $y = -3$
3. $(x - 2)^2 = -8(y + 3)$
4. $(y + 2)^2 = 12(x + 1)$
5. C

Review the Parabola: What do you remember?

vertical $(x-h)^2=4p(y-k)$ horizontal $(y-k)^2=4p(x-h)$

vertex (h,k) focus: $(h,k+p)$ vertex (h,k) focus: $(h+p,k)$

aos: $x=h$ directrix: $y=k-p$ aos: $y=k$ directrix: $x=h-p$

Then

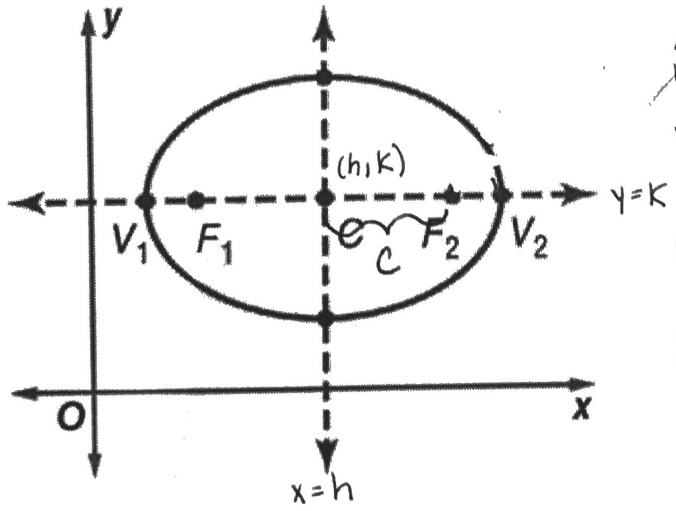
You analyzed and graphed parabolas.
(Lesson 7–1)

Now

- Analyze and graph equations of ellipses and circles.
- Use equations to identify ellipses and circles.

KeyConcept Standard Forms of Equations for Ellipses

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



Center (h,k)

Axis (major and minor)
major $y=k$ minor $x=h$

Vertices (on major axis)
$(h\pm a, k)$

Co-Vertices (on minor axis)
$(h, k\pm b)$

Foci $(h\pm c, k)$

$c=\sqrt{a^2-b^2}$

a^2 is under x

a^2 is under y

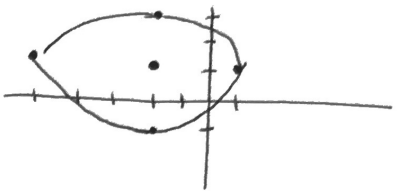
* a^2 is always the bigger denominator

EXAMPLE 1 Graph Ellipses

a^2 under x

A. Graph the ellipse $\dfrac{(x+2)^2}{9a^2} + \dfrac{(y-1)^2}{4b^2} = 1.$

Center $(-2, 1)$



Axis

Major $y = 1$

Minor $x = -2$

$a = 3$ Vertices (on major axis)

$(-2+3, 1) = (1, 1)$ and $(-2-3, 1) = (-5, 1)$

Co-Vertices (on minor axis)

$(-2, 1+-2) = (-2, -1)$ and $(-2, 1--2) = (-2, 3)$

Foci

$(-2+\sqrt{5}, 1)$ and $(-2-\sqrt{5}, 1)$

$c = \sqrt{9-4}$
$= \sqrt{5}$

EXAMPLE 1 Graph Ellipses

B. Graph the ellipse $4x^2 + 24x + y^2 - 10y - 3 = 0.$

$4(x^2+6x) + y^2 - 10y = 3$

$4(x+3)^2 + (y-5)^2 = 3 + 4(9) + 25$

$\dfrac{4(x+3)^2}{64} + \dfrac{(y-5)^2}{64} = \dfrac{64}{64}$

$\dfrac{(x+3)^2}{16} + \dfrac{(y-5)^2}{64} = 1$

a^2 under y

Center $(-3, 5)$

Axis

Major $x = -3$

Minor $y = 5$

$a = 8$ Vertices (on major axis)

$(-3, 5+8) = (-3, 13)$ and $(-3, 5-8) = (-3, -3)$

$b = 4$ Co-Vertices (on minor axis)

$(-3+4, 5) = (1, 5)$ and $(-3-4, 5) = (-7, 5)$

Foci $(-3, 5+4\sqrt{3})$, $(-3, 5-4\sqrt{3})$

$c = \sqrt{64-16}$
$= \sqrt{48}$
$= 4\sqrt{3}$

EXAMPLE 1 ☑ Guided Practice

Graph the ellipse
$144x^2 + 1152x + 25y^2 - 300y - 396 = 0$.

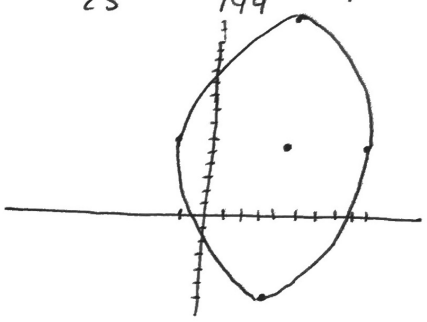
$144(x^2 + 8x) + 25(y^2 - 12y) = 396$

$144(x-4)^2 + 25(y-6)^2 = 396 + 144(16) + 25(36)$

Center $(4, 6)$

$\frac{144(x-4)^2}{3600} + \frac{25(y-6)^2}{3600} = \frac{3600}{3600}$

$\frac{(x-4)^2}{25} + \frac{(y-6)^2}{144} = 1$



Axis

Major $x = 4$

Minor $y = 6$

$a = 12$

Vertices (on major axis)

$(4, 18)$ and $(4, -6)$

$b = 5$

Co-Vertices (on minor axis)

$(9, 6)$ and $(-1, 6)$

$c = \sqrt{144 - 25}$

$c = \sqrt{119}$

Foci

$(4, 6 + \sqrt{119})$ and $(4, 6 - \sqrt{119})$

EXAMPLE 2 Write Equations Given Characteristics

A. Write an equation for an ellipse with a major axis from (5, –2) to (–1, –2) and a minor axis from (2, 0) to (2, –4).

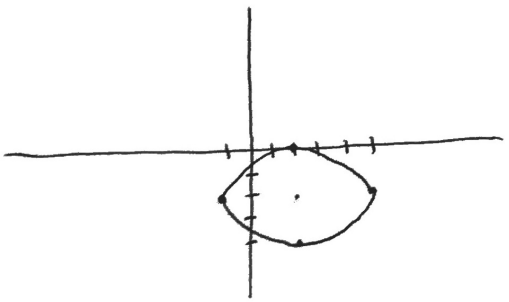
center: $(2, -2)$

$a = 3$

$b = 2$

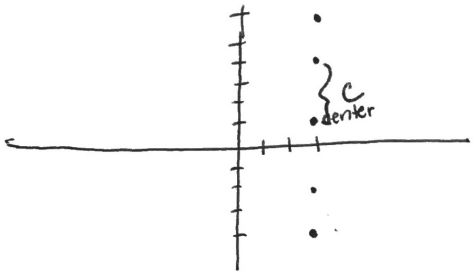
a^2 under x

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



EXAMPLE 2 Write Equations Given Characteristics

B. Write an equation for an ellipse with vertices at (3, –4) and (3, 6) and foci at (3, 4) and (3, –2)



center: (3, 1)

$c = 3$

$a = 5$

a^2 under y

$c = \sqrt{a^2 - b^2}$

$3 = \sqrt{25 - b^2}$

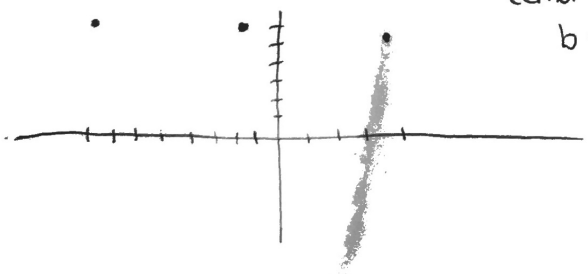
$9 = 25 - b^2$

$b^2 = 16$

$$\frac{(x-3)^2}{16} + \frac{(y-1)^2}{25} = 1$$

EXAMPLE 2 Guided Practice

Write an equation for an ellipse with co-vertices (minor axis) (–8, 6) and (4, 6) and major axis of length 18.



center : (–2, 6)

$b = 6$

$a = 9$

a^2 under y

$$\frac{(x+2)^2}{36} + \frac{(y-6)^2}{81} = 1$$