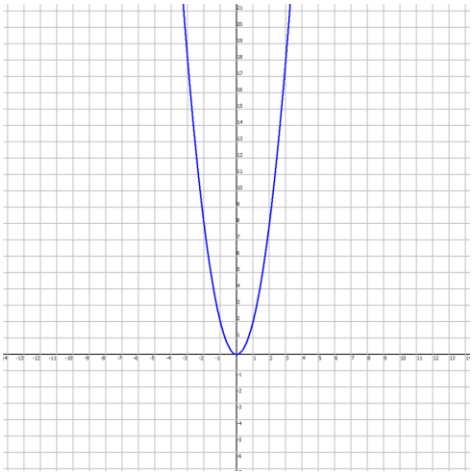
Conic Sections

Parabolas

Review Queue

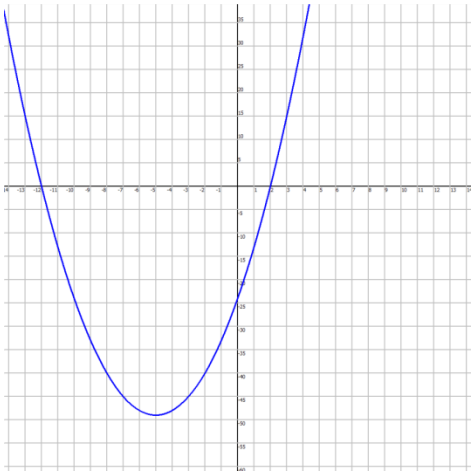
1. vertex: (0, 0), axis: $x = 0$, intercept: (0, 0)

   ans-1001-08



2. vertex (-5, -49), axis: $x = -5$

   ans-1001-09



3. (9, 0) and (-2, 0)

Parabolas with Vertex at (0, 0)

1. up 2. left 3. down

4. focus: (0, -0.5), directrix: y = 0.5

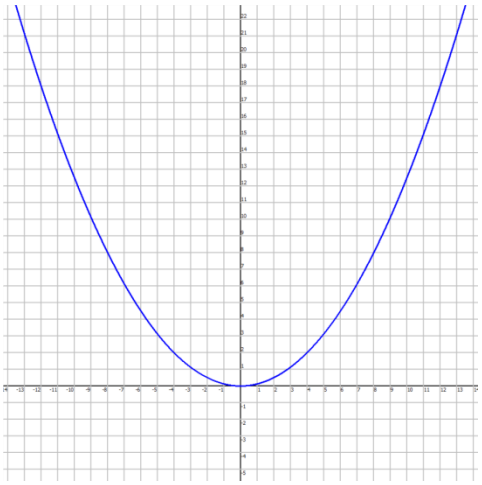
5. focus: (0.0625, 0), directrix: x = -0.0625

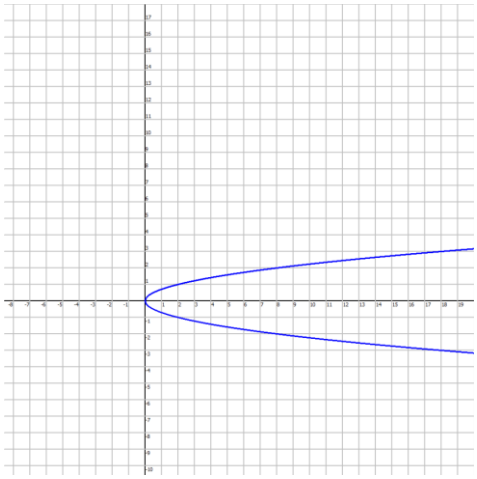
6. focus: (-1.25, 0), directrix: x = 1.25

7. focus: (0, 2), directrix: y = -2ans-1001-01

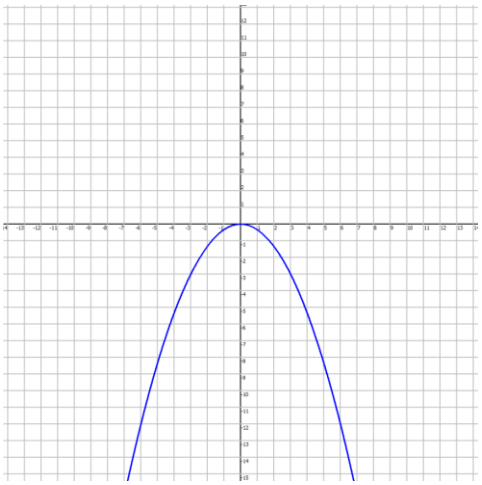
8. focus: (0.125, 0), directrix: x = -0.125

   ans-1001-02





9. focus: (0, -0.75), directrix: y = 0.75 ans-1001-03



10. $y^2 = 16x$

11. $y^2 = -40x$

12. $x^2 = 14y$

13. $p = \frac{1}{4a}$, p and a have an inverse relationship.

14. see worked out solution key

15. 16 inches above the vertex

Parabolas with Vertex at (*h*, *k*)

1. vertex: (-1, 6), focus: (-1, 5.25), directrix: y = 6.75, axis: x = -1

2. vertex: (3, 7), focus: (3, 7.25), directrix: y = 6.75, axis: x = 3

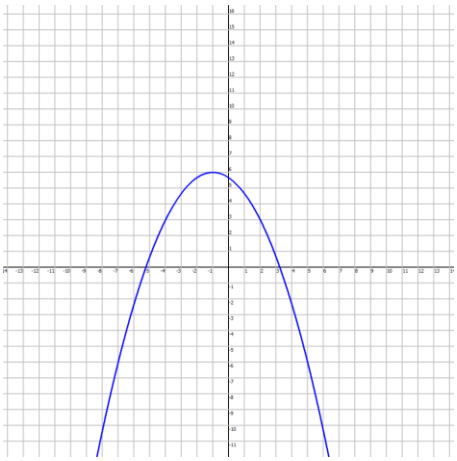
3. vertex: (-1, -2), focus: (1, -2), directrix: x = -3, axis: y = -2

4. vertex: (3, 0), focus: (0.5, 0), directrix: x = 5.5, axis: y = 0

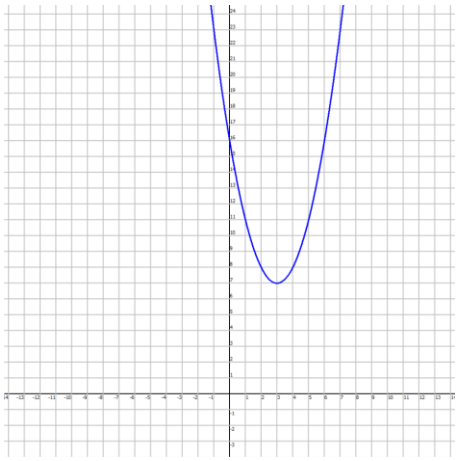
5. vertex: (-6, -8), focus: (-6, -7), directrix: y = -9, axis: x = -6

6. vertex: (0, 5), focus: (-0.125, 5), directrix: x = 0.125, axis: y = 5

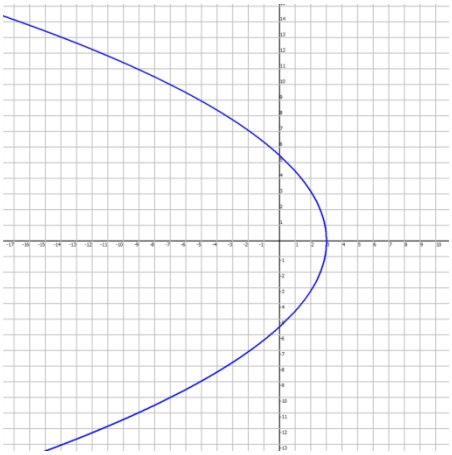
7. ans-1001-04



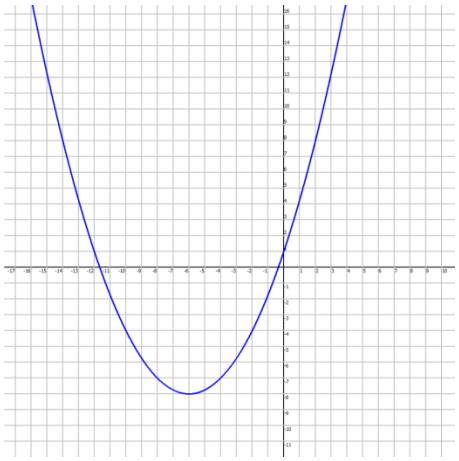
8. ans-1001-05



9. ans-1001-06



10. ans-1001-07



11. $(x-2)^2=-12(y+1)$

12. $(y-6)^2=-20(x+3)$

13. $(x-6)^2=2(y-10)$

14. $(y+2)^2=8(x-1)$

15. $(x-4)^2=-2(y+3)$, vertex is (4, -3)

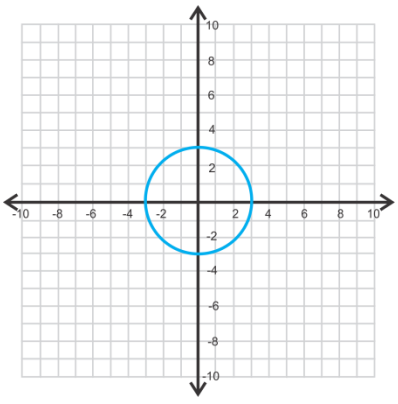
Circles

Review Queue

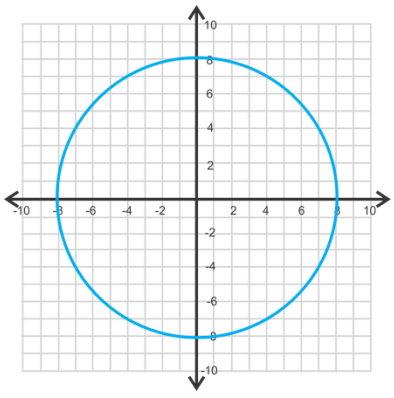
1. 10 2. 12 3. A = 16π, C = 8π 4. 100π

Circles Centered at the Origin

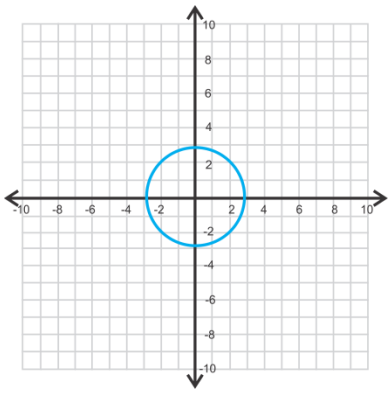
1. ans-1002-01



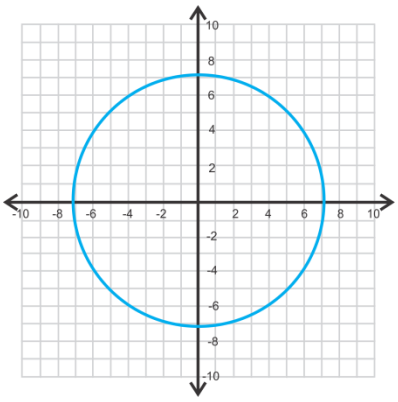
2. ans-1002-02



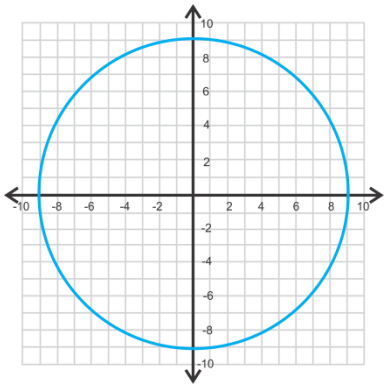
3. ans-1002-03



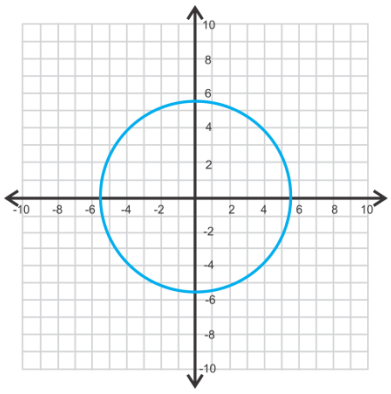
4. ans-1002-04



5. ans-1002-05



6. ans-1002-06



7. $x^2+y^2=196$

8. $x^2+y^2=36$

9. $x^2+y^2=162$

10. $x^2+y^2=625$

11. $x^2+y^2=8$

12. $x^2+y^2=181$

13. no

14. yes

15. no

16. a) $-\frac{1}{3}$ b) 3 c) $y=3x+10$

17. $y=-\frac{3}{5}x+\frac{34}{5}$

Circles Centered at (*h*, *k*)

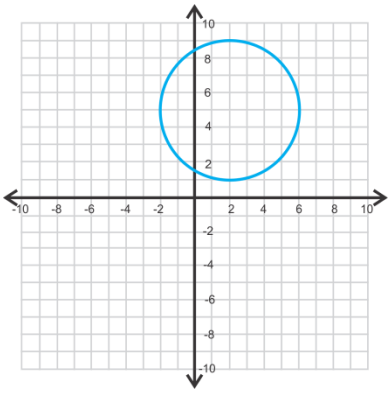
1. D

2. B

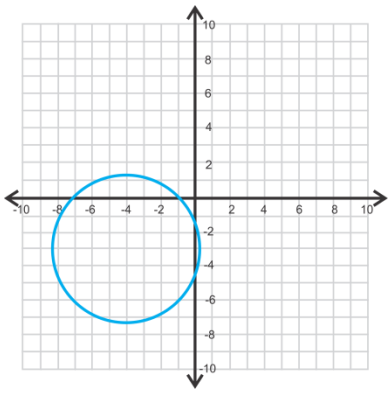
3. A

4. C

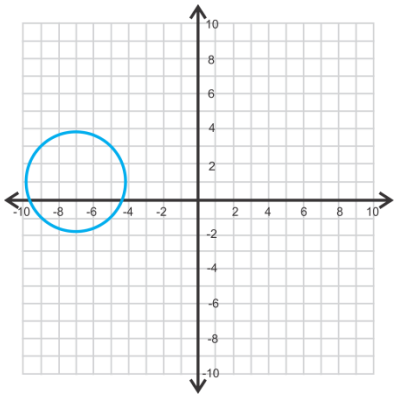
5. ans-1002-07



6. ans-1002-08



7. ans-1002-09



8. $(x+3)^2+(y+3)^2=49$

9. $(x+7)^2+(y-6)^2=15$

10. $(x-8)^2+(y+1)^2=289$

11. $(x+2)^2+(y+5)^2=74$

12. $(x-1)^2+(y-2)^2=26$

13. $(x-8)^2+(y+5)^2=68$

14. No, because $(-9+5)^2+(12-6)^2\neq 54$.

15. $y=\frac{1}{3}x+\frac{25}{3}$

16. $(x+2)^2+(y-4)^2=9$

Ellipses

Review Queue

1. Answers will vary; pools, Washington DC, mirrors, etc.

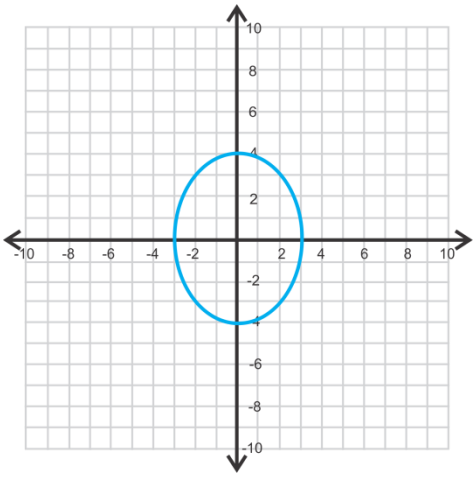
2. $(x+9)^2+(y-2)^2=121$

3. $y=\frac{2}{3}x+5$

Ellipses Centered at the Origin

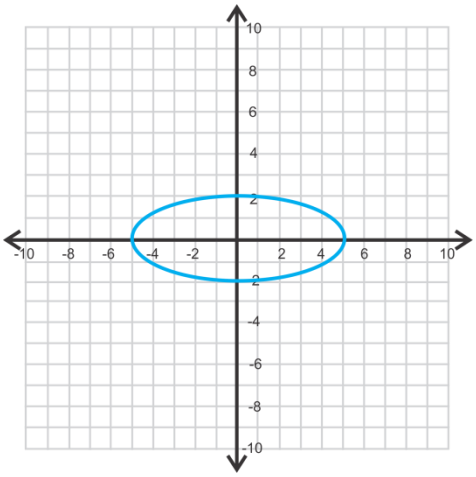
1. vertices: (0, ±4), co-vertices: (±3, 0),

   foci: $\left(0,\pm\sqrt{7}\right)$ ans-1003-01



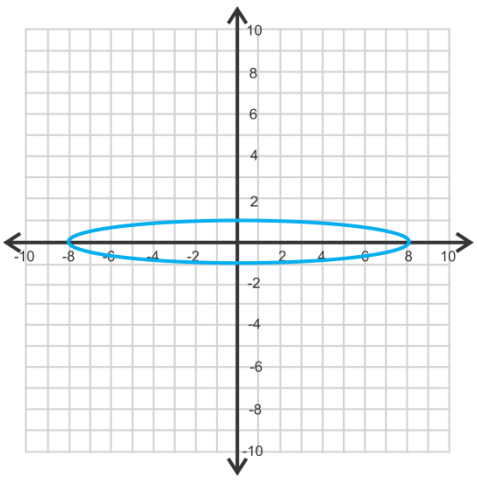
2. vertices: (±5, 0), co-vertices: (0, ±2),

   foci: $\left(\pm\sqrt{21},0\right)$ ans-1003-02



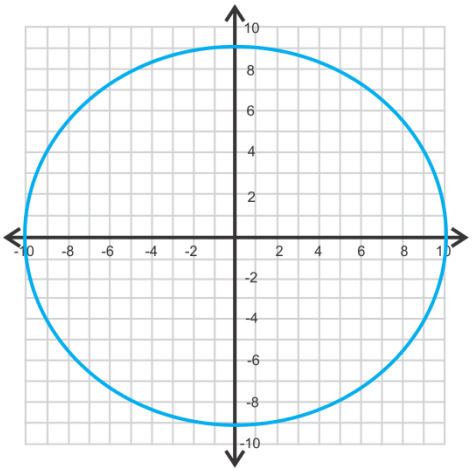
3. vertices: (±8, 0), co-vertices: (0, ±1),

   foci: $\left(\pm3\sqrt{7},0\right)$ ans-1003-03



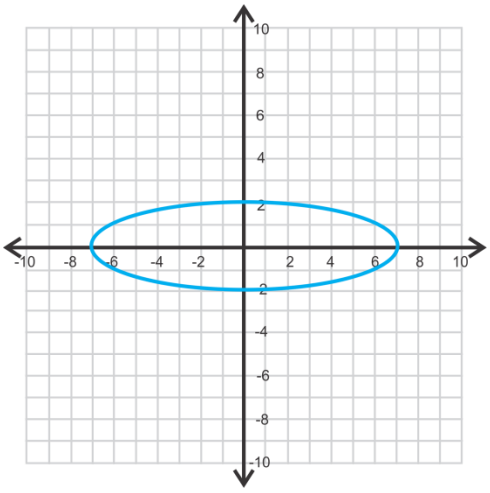
4. vertices: (±10, 0), co-vertices: (0, ±9),

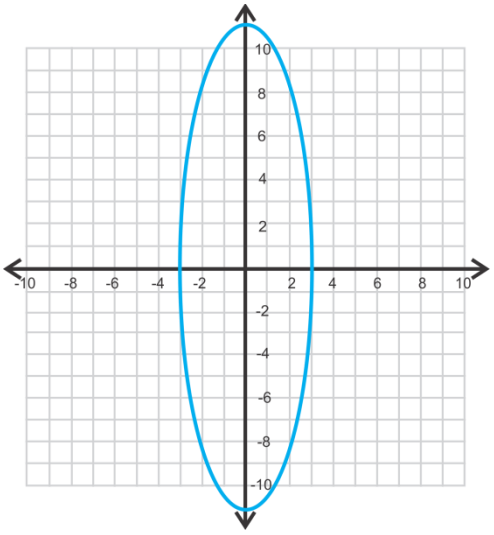
   foci: $\left(\pm\sqrt{19},0\right)$ ans-1003-04



5. vertices: (±7, 0), co-vertices: (0, ±2), foci: $\left(\pm 3\sqrt{5}, 0\right)$ ans-1003-05

6. vertices: (0, ±11), co-vertices: (±3, 0), foci: $\left(\pm\sqrt{21}, 0\right)$ ans-1003-06





7. $\frac{x^2}{9} + y^2 = 1$

8. $\frac{x^2}{49} + \frac{y^2}{81} = 1$

9. $\frac{x^2}{4} + \frac{y^2}{25} = 1$

10. $\frac{x^2}{4} + \frac{y^2}{7} = 1$

11. $\frac{x^2}{36} + \frac{y^2}{61} = 1$

12. $\frac{x^2}{145} + \frac{y^2}{64} = 1$

13. $\frac{x^2}{279{,}841} + \frac{y^2}{203{,}852.25} = 1$

Ellipses Centered at (*h*, *k*)

1. center: (-5, -1), vertices: (-5, -7) and (-5, 5), co-vertices: (0, -1) and (-10, -1), foci: $\left(-5, -1 \pm \sqrt{11}\right)$

2. center: (-2, 6), vertices: (-6, 6) and (4, 6), co-vertices: (-2, 5) and (-2, 7), foci: $\left(-2 \pm \sqrt{15},\ 6\right)$

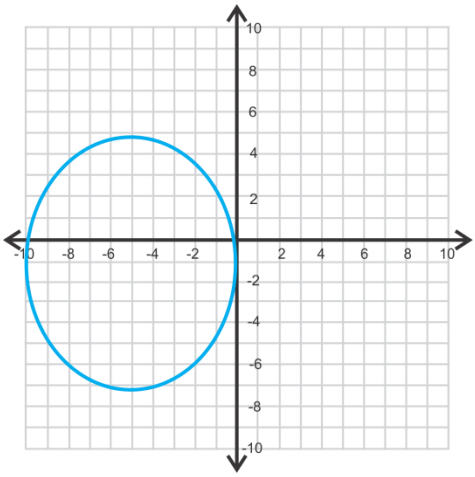
3. center: (-5, -1), vertices: (-5, -7) and (-5, 5), co-vertices: (0, -1) and (-10, -1), foci: $\left(-5, -1 \pm \sqrt{11}\right)$

4. center: (0, 6), vertices: (8, 6) and (-8, 6), co-vertices: (0, 1) and (-0, 11), foci: $\left(\pm\sqrt{39}, 6\right)$

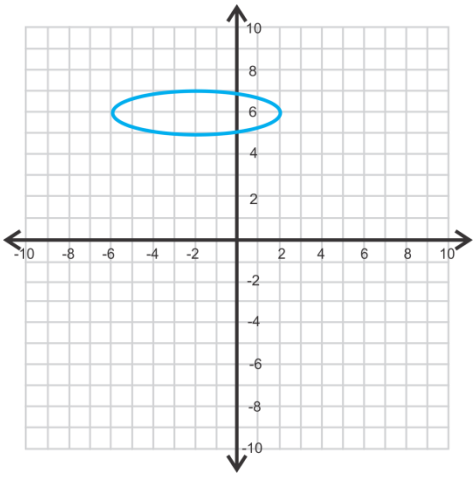
5. center: (8, 4), vertices: (8, 1) and (8, 7), co-vertices: (7, 4) and (9, 4), foci: $\left(8, 4 \pm 2\sqrt{2}\right)$

6. center: (-4, -5), vertices: (-4, 4) and (-4, -13), co-vertices: (-2, -5) and (-6, -5), foci: $\left(-4, -5 \pm \sqrt{77}\right)$

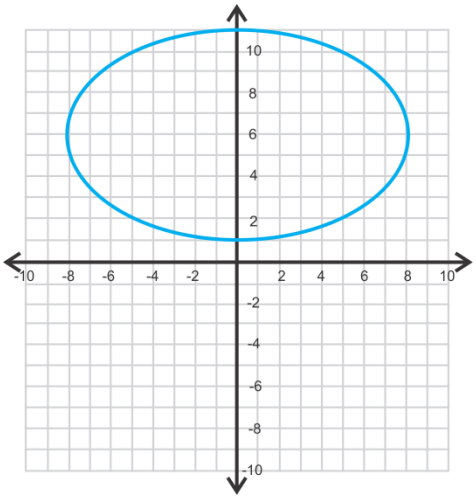
7. ans-1001-07



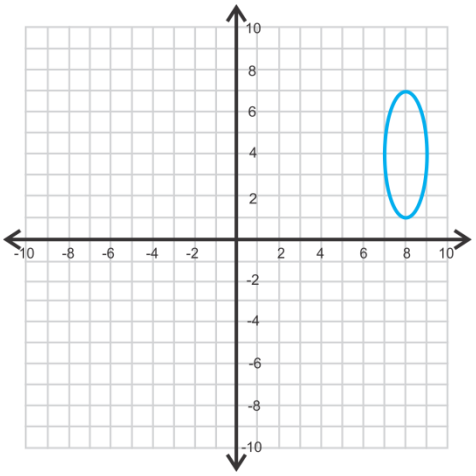
8. ans-1001-08



9. ans-1001-09



10. ans-1001-10



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

12. $\frac{(x-5)^2}{65}+\frac{(y+3)^2}{81}=1$

13. $\frac{(x-7)^2}{49}+\frac{(y-4)^2}{13}=1$

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

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

Hyperbolas

Review Queue Answers

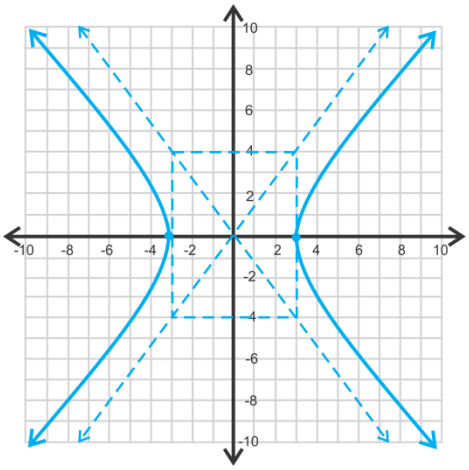
1. v(1, -5), f(3, -5), x = 1

2. c(2, 6), r = 5

3. c(-7, 3), v(-4, 3) and (-10, 3), cv(-7, 11) and (-7, -5), f$\left(-7\pm\sqrt{55},3\right)$

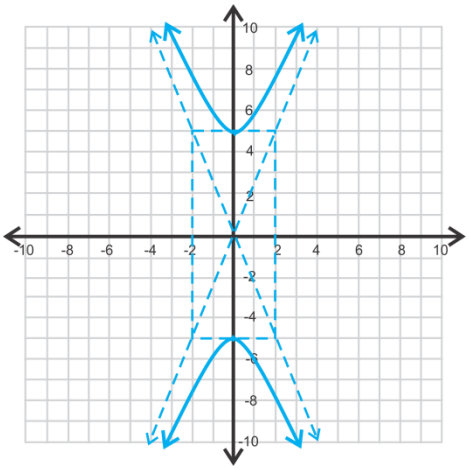
Graphing Hyperbolas Centered at the Origin

1. (±3, 0), (±5, 0), $y = \pm\frac{4}{3}$



ans-1004-01

2. (0, ±5), $\left(0, \pm\sqrt{29}\right)$, $y = \pm\frac{5}{2}$



ans-1004-02

3. (±9, 0), $\left(\pm\sqrt{145}, 0\right)$, $y = \pm\frac{8}{9}$

4. (±4, 0), $\left(\pm 2\sqrt{2}, 0\right)$, $y = \pm x$

5. (0, ±7), $\left(0, \pm\sqrt{74}\right)$, $y = \pm\frac{7}{5}$

6. (0, ±3), $\left(0, \pm\sqrt{130}\right)$, $y = \pm\frac{3}{11}$

7. (0, ±1), $\left(0, \pm\sqrt{2}\right)$, $y = \pm x$

8. (±8, 0), $\left(\pm 2\sqrt{17}, 0\right)$, $y = \pm\frac{1}{2}$

9. (0, ±4), $\left(0, \pm 2\sqrt{17}\right)$, $y = \pm\frac{1}{2}$

10. Answers will vary.

11. Foci are $\left(\pm\sqrt{34}, 0\right)$ and $\left(\pm 4, 0\right)$.

Writing the Equation of a Hyperbola, Centered at the Origin

1. $\frac{x^2}{4} - \frac{y^2}{21} = 1$

2. $\frac{y^2}{85} - \frac{x^2}{36} = 1$

3. $\frac{y^2}{25} - \frac{x^2}{25} = 1$

7. $\frac{x^2}{36} - \frac{y^2}{9} = 1$

8. $\frac{y^2}{729} - \frac{x^2}{81} = 1$

9. $\frac{y^2}{64} - \frac{x^2}{8} = 1$

7. $\frac{x^2}{25} - \frac{y^2}{16} = 1$ or $\frac{y^2}{16} - \frac{x^2}{25} = 1$

8. $\frac{x^2}{4} - \frac{y^2}{9} = 1$ or $\frac{x^2}{16} - \frac{y^2}{36} = 1$

9. $\frac{y^2}{36} - x^2 = 1$ or $\frac{y^2}{144} - \frac{x^2}{4} = 1$

10. $\frac{x^2}{49} - \frac{y^2}{100} = 1$ or $\frac{y^2}{100} - \frac{x^2}{49} = 1$

Hyperbolas Centered at (*h*, *k*)

1. (-5.-1), (0, -1) and (-10, -1), $\left(-5\pm\sqrt{61},-1\right)$, $y+1=\pm\frac{6}{5}(x+5)$

2. (6, -2), (6, 2) and (6, -6), $\left(6,-2\pm\sqrt{17}\right)$, $y+2=\pm4(x-6)$

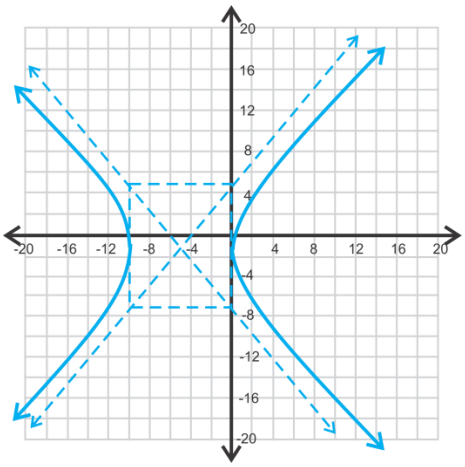
3. (3, 2), (3, 5) and (3, -1), $\left(3,2\pm\sqrt{58}\right)$, $y-2=\pm\frac{3}{2}(x-3)$

4. (0, 6), (8, 6) and (-8, 6), $\left(\pm\sqrt{68},6\right)$, $y-6=\pm\frac{5}{8}x$

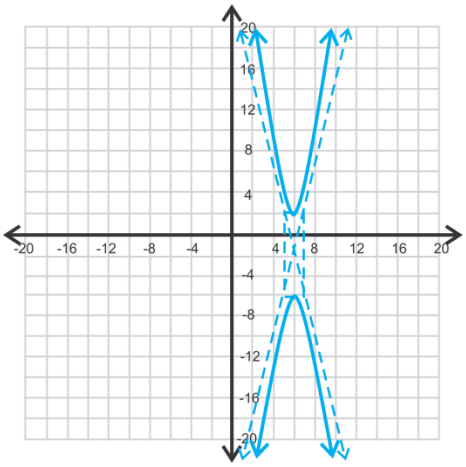
5. (8, 4), (7, 4) and (9, 4), $\left(8\pm\sqrt{10},4\right)$, $y-4=\pm3(x-8)$

6. (-5, -4), (-5, -2) and (-5, -6), $\left(-5,-4\pm\sqrt{85}\right)$, $y+4=\pm\frac{2}{9}(x+5)$

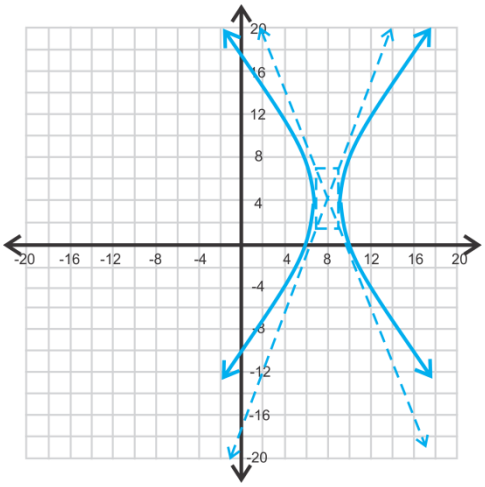
7. ans-1004-05



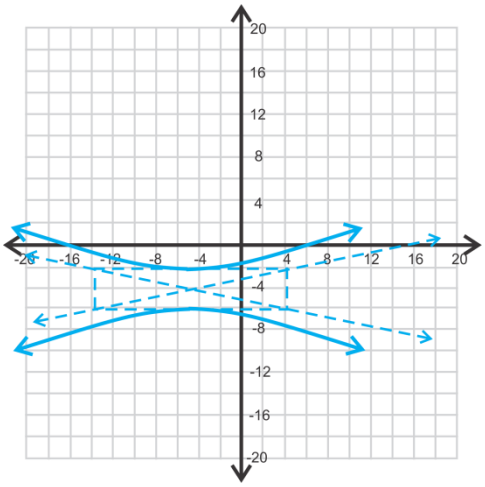
8. ans-1004-06



9. ans-1004-07



10. ans-1004-08



11. $\frac{(x-3)^2}{25}-\frac{(y+3)^2}{49}=1$

12. $\frac{(y+3)^2}{81}-\frac{(x-5)^2}{63}=1$

13. $\frac{(x+1)^2}{81}-\frac{(y+3)^2}{16}=1$

14. $\frac{(x+5)^2}{9}-\frac{(y+4)^2}{27}=1$

15. $\frac{(x+5)^2}{4}-\frac{(y+2)^2}{49}=1$

General Conic Equations and Solving Non-Linear Systems

Review Queue Answers

1. $x=3\pm\sqrt{3}$

2. $x=\frac{-2\pm4\sqrt{6}}{3}$

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

4. $\frac{(x-2)^2}{20}+\frac{(y-1)^2}{36}=1$

General Conic Equation

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

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

3. $\frac{(x+4)^2}{16}+\frac{(y+3)^2}{49}=1$

4. $(x-5)^2+y^2=4$

5. circle, (-1, 1.5)

6. parabola, (1, -9)

7. ellipse, (2, 0.5)

8. hyperbola, (1.5, -1)

9. parabola, (-5, -3)

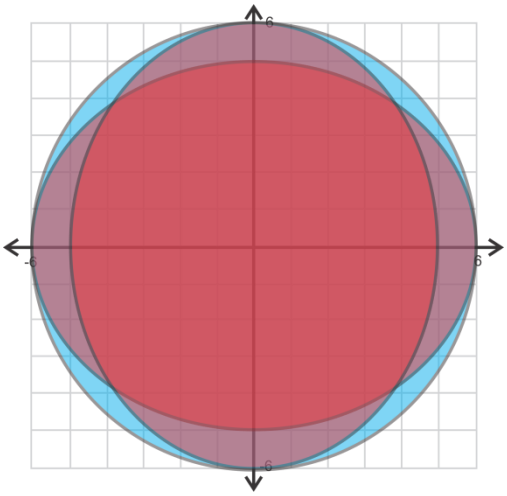
10. hyperbola, (-2, 7)

Classifying Conic Sections

1.	circle	2.	hyperbola	3.	ellipse
4.	parabola	5.	parabola	6.	circle
7.	C	8.	D	9.	A
10.	B	11.	parabola	12.	circle
13.	hyperbola	14.	parabola		

15. $A=36\pi$

a) ans-1005-01



b) Yes

c) $A=ab\pi$

d) $A=30\pi$, the ellipses are smaller than the circle

Solving Systems of Lines, Quadratics, and Conics

1. (-1, 8), (-1, -3), (3, 2.5)
2. (3, 7), -1, 2.75)
3. (-4, 0), (0, 3.5)
4. (-6.5, 6.5), (6. -3)
5. 0, 1, 2, 3, or 4
6. 0, 1, 2, 3, or 4
7. (1.722, 0.722), (-2.322, -3.322)
8. (1.69, 2.155), (0.71, 2.645)
9. (±1.076, -2.843), (±1.610, -1.407)
10. (0, 10), (2, -9)
11. no solution
12. (1, 2), (-2.67, 4.75)
13. $\left(\pm\frac{r}{\sqrt{1+m^2}},\pm\frac{mr}{\sqrt{1+m^2}}\right)$
14. (2, 2) and (-2, -2)