

Conics Review

Classify each conic section and write its equation in standard form. For parabolas, identify the vertex and focus. For circles, identify the center and radius. For ellipses and hyperbolas identify the center, vertices, and foci.

1) $-4x^2 + y^2 + 2y - 3 = 0$

2) $x^2 + y^2 + 4x + 8y + 18 = 0$

3) $x^2 - y^2 - 25 = 0$

4) $49x^2 + y^2 - 49 = 0$

5) $-2y^2 + x - 20y - 50 = 0$

6) $x^2 + y^2 + 8y + 15 = 0$

7) $4x^2 + y^2 + 24x + 2y + 1 = 0$

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

Identify the vertex, focus, and directrix of each. Then sketch the graph.

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

10) $-(x - 1) = (y + 4)^2$

11) $-(y - 2) = (x + 4)^2$

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

Use the information provided to write the transformational form equation of each parabola.

13) Vertex at origin, Focus: $\left(0, -\frac{1}{4}\right)$

14) Vertex at origin, Directrix: $y = -\frac{1}{68}$

15) Vertex: $(2, 4)$, Focus: $\left(\frac{47}{24}, 4\right)$

16) Vertex: $(-4, -9)$, Focus: $\left(-\frac{17}{4}, -9\right)$

17) Vertex: $(0, -2)$, Directrix: $x = -\frac{1}{2}$

18) Vertex: $(5, 0)$, Directrix: $y = -\frac{1}{8}$

Identify the center, vertices, and foci of each. Then sketch the graph.

19) $\frac{(x - 4)^2}{4} + \frac{(y - 1)^2}{16} = 1$

20) $\frac{x^2}{9} + \frac{y^2}{49} = 1$

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

22) $\frac{(x - 1)^2}{36} + \frac{(y + 1)^2}{16} = 1$

Use the information provided to write the standard form equation of each ellipse.

23) Vertices: $(-7, 10), (-7, -12)$
 Foci: $(-7, -1 + 2\sqrt{10}), (-7, -1 - 2\sqrt{10})$

24) Vertices: $(16, 9), (4, 9)$
 Foci: $(10 + 2\sqrt{5}, 9), (10 - 2\sqrt{5}, 9)$

25) Center: $(-2, 5)$
 Vertex: $(4, 5)$
 Focus: $(-2 + 2\sqrt{5}, 5)$

26) Center: $(6, 0)$
 Vertex: $(6, 7)$
 Focus: $(6, \sqrt{33})$

27) Foci: $(\frac{7}{2}, \frac{7}{2}), (-\frac{25}{2}, \frac{7}{2})$
 Endpoints of major axis: $(\frac{11}{2}, \frac{7}{2}), (-\frac{29}{2}, \frac{7}{2})$

28) Foci: $(4, -6), (4, -14)$
 Endpoints of major axis: $(4, -5), (4, -15)$

Identify the vertices, foci, and asymptotes of each. Then sketch the graph.

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

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

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

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

Use the information provided to write the standard form equation of each hyperbola.

33) Vertices: $(14, 6), (-10, 6)$
 Conjugate Axis is 20 units long

34) Vertices: $(4, 5), (4, -19)$
 Conjugate Axis is 6 units long

35) Vertices: $(-2 + \sqrt{165}, 8), (-2 - \sqrt{165}, 8)$
 Foci: $(-2 + \sqrt{330}, 8), (-2 - \sqrt{330}, 8)$

36) Vertices: $(-7, 5), (-13, 5)$
 Foci: $(-10 + \sqrt{34}, 5), (-10 - \sqrt{34}, 5)$

37) Vertices: $(7, 3), (7, -9)$
 Distance from Center to Focus = $2\sqrt{34}$

38) Vertices: $(9, 7), (9, -3)$
 Distance from Center to Focus = $\sqrt{89}$

39) Vertices: $(10, -1), (-14, -1)$
 Asymptotes: $y = \frac{1}{6}x - \frac{2}{3}$
 $y = -\frac{1}{6}x - \frac{4}{3}$

40) Vertices: $(1, 24), (1, -4)$
 Asymptotes: $y = 7x + 3$
 $y = -7x + 17$

41) Foci: $(2 + \sqrt{85}, 7), (2 - \sqrt{85}, 7)$
 Asymptotes: $y = \frac{6}{7}x + \frac{37}{7}$
 $y = -\frac{6}{7}x + \frac{61}{7}$

42) Foci: $(9, 4 + \sqrt{65}), (9, 4 - \sqrt{65})$
 Asymptotes: $y = \frac{7}{4}x - \frac{47}{4}$
 $y = -\frac{7}{4}x + \frac{79}{4}$

Answers to Conics Review

1) Hyperbola

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

Center: $(0, -1)$

Vertices: $(0, 1), (0, -3)$

Foci: $(0, -1 + \sqrt{5}), (0, -1 - \sqrt{5})$

3) Hyperbola

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

Center: $(0, 0)$

Vertices: $(5, 0), (-5, 0)$

Foci: $(5\sqrt{2}, 0), (-5\sqrt{2}, 0)$

6) Circle

$$x^2 + (y+4)^2 = 1$$

Center: $(0, -4)$

Radius: 1

2) Circle

$$(x+2)^2 + (y+4)^2 = 2$$

Center: $(-2, -4)$

Radius: $\sqrt{2}$

4) Ellipse

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

Center: $(0, 0)$

Vertices: $(0, 7), (0, -7)$

Foci: $(0, 4\sqrt{3}), (0, -4\sqrt{3})$

7) Ellipse

$$\frac{(x+3)^2}{9} + \frac{(y+1)^2}{36} = 1$$

Center: $(-3, -1)$

Vertices: $(-3, 5), (-3, -7)$

Foci: $(-3, -1 + 3\sqrt{3}), (-3, -1 - 3\sqrt{3})$

5) Parabola

$$x = 2(y+5)^2$$

Vertex: $(0, -5)$

Focus: $(\frac{1}{8}, -5)$

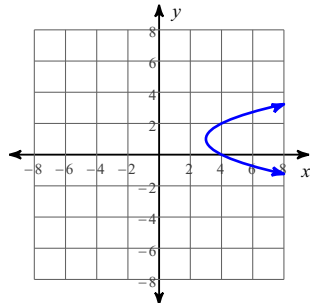
8) Parabola

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

Vertex: $(2, 4)$

Focus: $(2, \frac{17}{4})$

9)

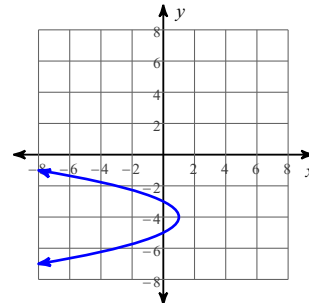


Vertex: $(3, 1)$

Focus: $(\frac{13}{4}, 1)$

Directrix: $x = \frac{11}{4}$

10)

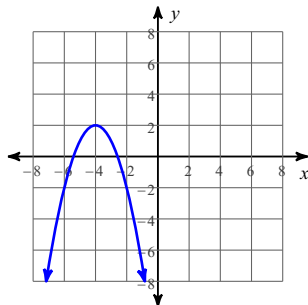


Vertex: $(1, -4)$

Focus: $(\frac{3}{4}, -4)$

Directrix: $x = \frac{5}{4}$

11)

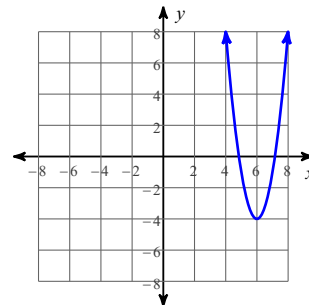


Vertex: $(-4, 2)$

Focus: $(-4, \frac{7}{4})$

Directrix: $y = \frac{9}{4}$

12)



Vertex: $(6, -4)$

Focus: $(6, -\frac{47}{12})$

Directrix: $y = -\frac{49}{12}$

13) $-y = x^2$

14) $\frac{1}{17}y = x^2$

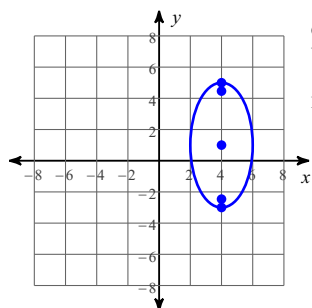
15) $-\frac{1}{6}(x-2) = (y-4)^2$

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

17) $2x = (y+2)^2$

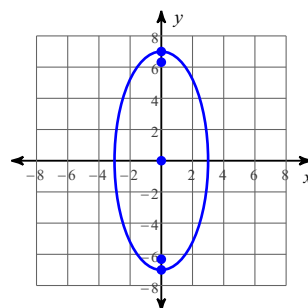
18) $\frac{1}{2}y = (x-5)^2$

19)



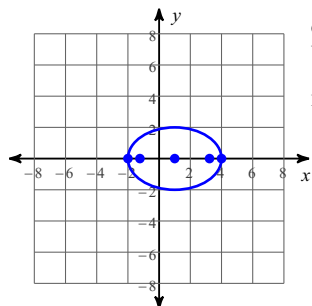
Center: $(4, 1)$
 Vertices: $(4, 5)$
 $(4, -3)$
 Foci: $(4, 1 + 2\sqrt{3})$
 $(4, 1 - 2\sqrt{3})$

20)



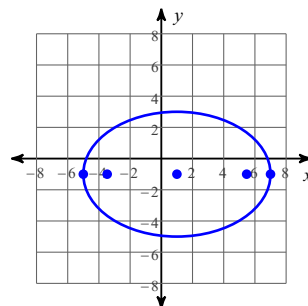
Center: $(0, 0)$
 Vertices: $(0, 7)$
 $(0, -7)$
 Foci: $(0, 2\sqrt{10})$
 $(0, -2\sqrt{10})$

21)



Center: $(1, 0)$
 Vertices: $(4, 0)$
 $(-2, 0)$
 Foci: $(1 + \sqrt{5}, 0)$
 $(1 - \sqrt{5}, 0)$

22)



Center: $(1, -1)$
 Vertices: $(7, -1)$
 $(-5, -1)$
 Foci: $(1 + 2\sqrt{5}, -1)$
 $(1 - 2\sqrt{5}, -1)$

23)
$$\frac{(x+7)^2}{81} + \frac{(y+1)^2}{121} = 1$$

24)
$$\frac{(x-10)^2}{36} + \frac{(y-9)^2}{16} = 1$$

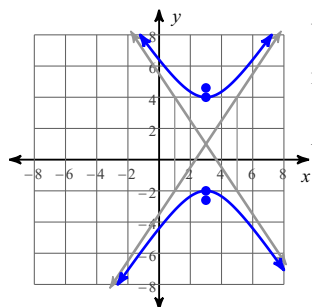
25)
$$\frac{(x+2)^2}{36} + \frac{(y-5)^2}{16} = 1$$

26)
$$\frac{(x-6)^2}{16} + \frac{y^2}{49} = 1$$

27)
$$\frac{\left(x + \frac{9}{2}\right)^2}{100} + \frac{\left(y - \frac{7}{2}\right)^2}{36} = 1$$

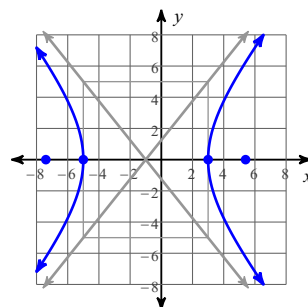
28)
$$\frac{(x-4)^2}{9} + \frac{(y+10)^2}{25} = 1$$

29)



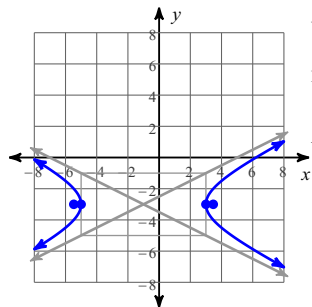
Vertices: $(3, 4)$
 $(3, -2)$
 Foci: $(3, 1 + \sqrt{13})$
 $(3, 1 - \sqrt{13})$
 Asym.: $y = \frac{3}{2}x - \frac{7}{2}$
 $y = -\frac{3}{2}x + \frac{11}{2}$

30)



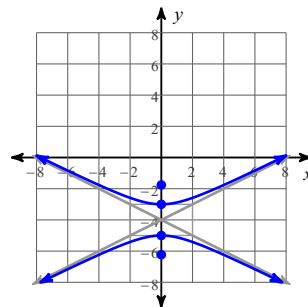
Vertices: $(3, 0)$
 $(-5, 0)$
 Foci: $(-1 + \sqrt{41}, 0)$
 $(-1 - \sqrt{41}, 0)$
 Asym.: $y = \frac{5}{4}x + \frac{5}{4}$
 $y = -\frac{5}{4}x - \frac{5}{4}$

31)



Vertices: $(3, -3)$
 $(-5, -3)$
 Foci: $(-1 + 2\sqrt{5}, -3)$
 $(-1 - 2\sqrt{5}, -3)$
 Asym.: $y = \frac{1}{2}x - \frac{5}{2}$
 $y = -\frac{1}{2}x - \frac{7}{2}$

32)



Vertices: $(0, -3)$
 $(0, -5)$
 Foci: $(0, -4 + \sqrt{5})$
 $(0, -4 - \sqrt{5})$
 Asym.: $y = \frac{1}{2}x - 4$
 $y = -\frac{1}{2}x - 4$

33)
$$\frac{(x-2)^2}{144} - \frac{(y-6)^2}{100} = 1$$

34)
$$\frac{(y+7)^2}{144} - \frac{(x-4)^2}{9} = 1$$

35)
$$\frac{(x+2)^2}{165} - \frac{(y-8)^2}{165} = 1$$

36)
$$\frac{(x+10)^2}{9} - \frac{(y-5)^2}{25} = 1$$

37)
$$\frac{(y+3)^2}{36} - \frac{(x-7)^2}{100} = 1$$

38)
$$\frac{(y-2)^2}{25} - \frac{(x-9)^2}{64} = 1$$

39)
$$\frac{(x+2)^2}{144} - \frac{(y+1)^2}{4} = 1$$

40)
$$\frac{(y-10)^2}{196} - \frac{(x-1)^2}{4} = 1$$

41)
$$\frac{(x-2)^2}{49} - \frac{(y-7)^2}{36} = 1$$

42)
$$\frac{(y-4)^2}{49} - \frac{(x-9)^2}{16} = 1$$