Unit 15 – Conic Sections

15.1) I can solve quadratic equations and inequalities by completing the square.

15.2) I can graph circles and their translations from given equations or characteristics with and without technology

15.3) I can graph parabolas and their translations from given equations or characteristics with and without technology

15.4) I can determine characteristics of circles from their equations and graphs

15.5) I can determine characteristics of parabolas from their equations and graphs

15.6) I can identify and write equations for circles from given characteristics and graphs

15.7) I can identify and write equations for parabolas from given characteristics and graphs

15.8) I can identify and write equations for ellipses from given characteristics and graphs

15.9) I can identify and write equations for hyperbolas from given characteristics and graphs

15.10) I can identify conic sections and their properties (e.g., parabola, circle, ellipse, hyperbolas) from their equations in standard form

15.1) I can solve quadratic equations and inequalities by completing the square.

Notes for Completing the square:

Sample Problems:

1) $v^2 - 8v - 100 = -8$

2) $x^2 - 16x + 51 = 4$

3) $6n^2 - 12n - 45 = 3$

4) $10a^2 + 20a - 82 = -2$

5) $3k^2 + 10k + 3 = 2$

6) $6x^2 - 2x - 36 = -8$

7) $9x^2 - 18x = -38$

8) $2n^2 = 4n - 70$

9) $k^2 + 27 = -9k$

10) $96 + 15p = -p^2$

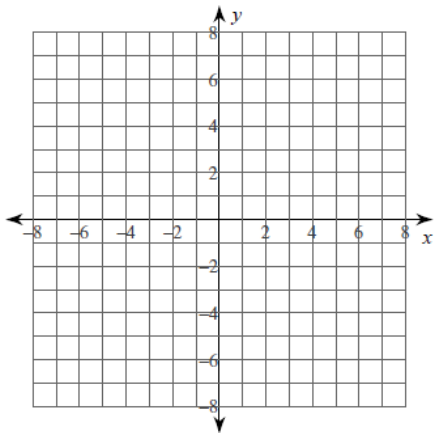Notes for Inequalities:

Sample Problems:

11) $y < x^2 - 6x + 8$

12) $y \geq -x^2 - 8x - 17$

13) $y > x^2 - 5x + 5$

14) $y \geq x^2 - 7x + 8$

Name_____

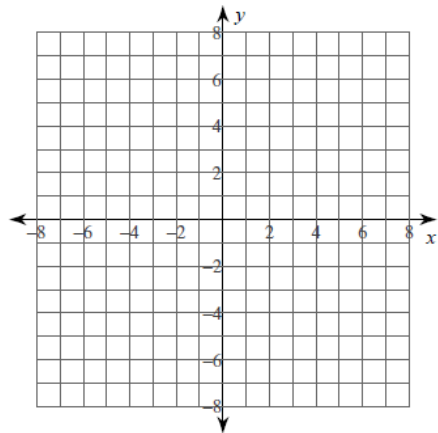**15.2) I can graph circles and their translations from given equations or characteristics with and without technology**

Notes for Circles:
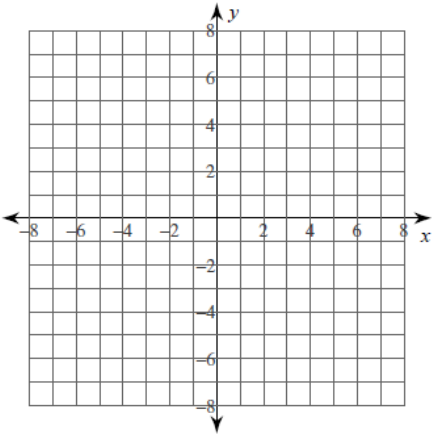
Sample Problems:
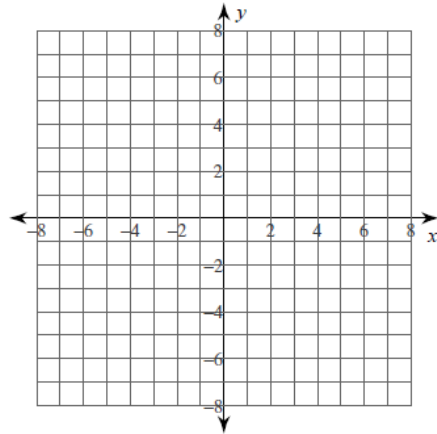
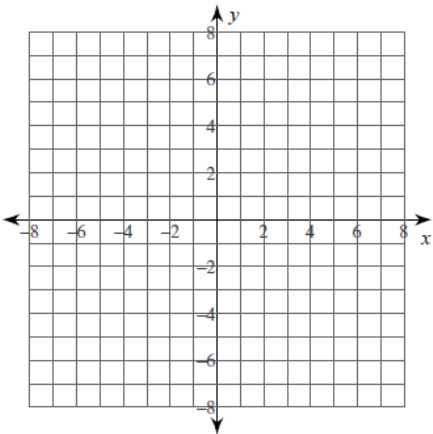15) $(x+3)^2 + y^2 = 16$

16) $(x+3)^2 + (y+1)^2 = 4$

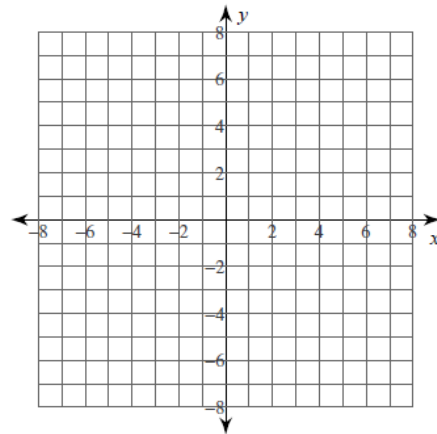17) $x^2 + y^2 + 8x + 6y + 20 = 0$

18) $x^2 + y^2 + 8x - 8y + 28 = 0$

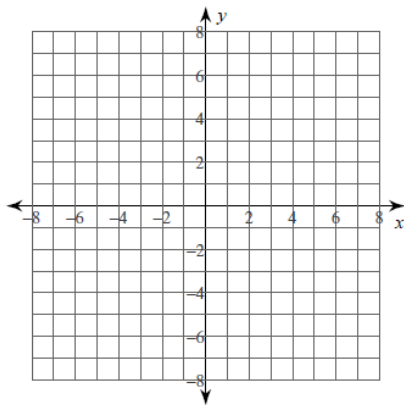19) $y^2 = 2x + 7 - x^2 + 2y$

20) $-6y + x^2 + y^2 = -5$

15.3) I can graph parabolas and their translations from given equations or characteristics with and without technology
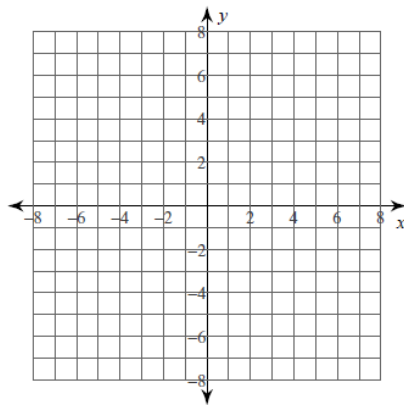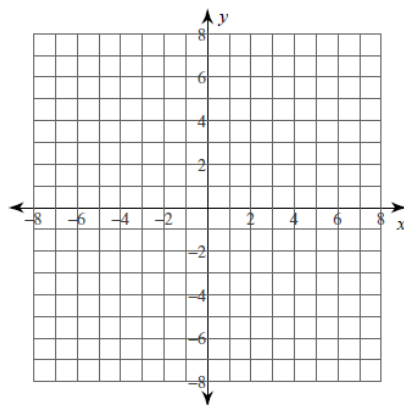
Notes for Parabolas:

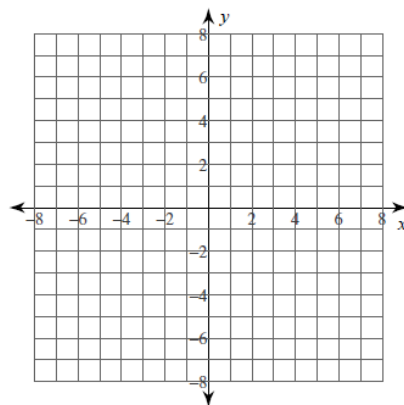Sample Problems:

21) $-4x = 1 + x^2 - y$

22) $12x = -28 - 4y - 3x^2$

23) $3y^2 + 17 + 12y = -x$

24) $0 = -y^2 - 5 + 2y - 4x$

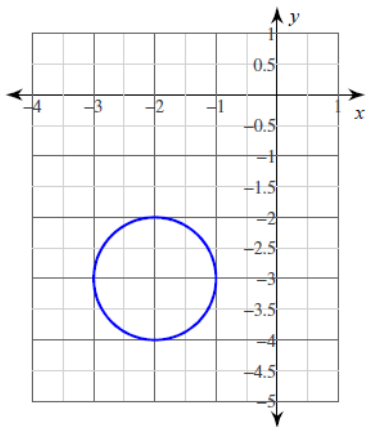## 15.4) I can determine characteristics of circles from their equations and graphs

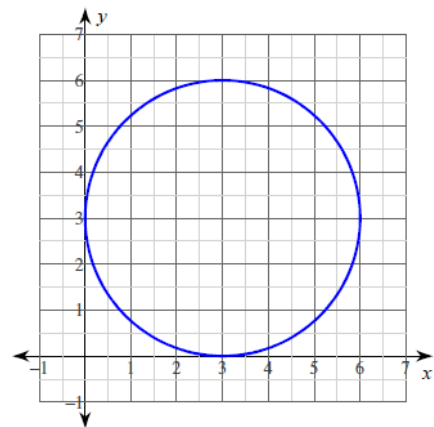Notes for Characteristics of Circles:

Sample Problems:

25) $24y + 26x + x^2 + 288 = -y^2$

26) $10x + y^2 - 14y = -38 - x^2$

27)

28)

15.5) I can determine characteristics of parabolas from their equations and graphs

Notes for determining characteristics from equations:

Sample problems:

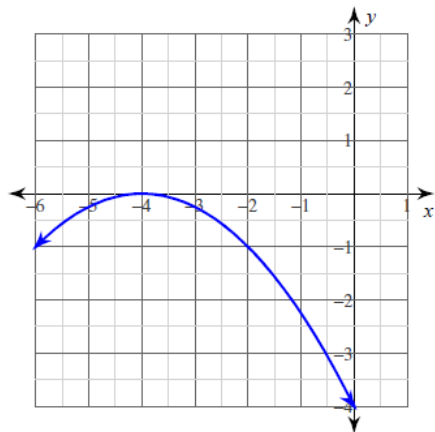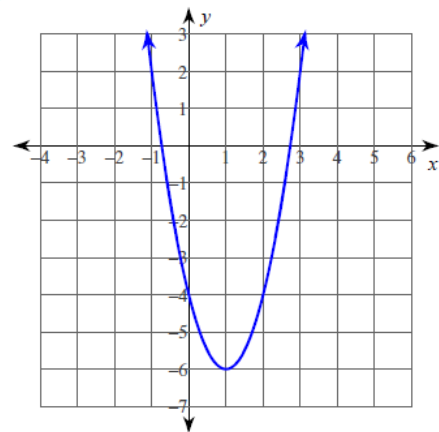31) $-(y - 81) = (x + 1)^2$

32) $y + 2x^2 = -33 + 16x$

Notes for determining characteristics from graphs:

Sample problems:

29)

30)

15.6) I can identify and write equations for circles from given characteristics and graphs

Notes for writing equations of circles:

Sample Problems:

33) Center: $(-12, 12)$
Radius: 6

34) Center: $(9, 5)$
Radius: 5

35) Center: $(12, -7)$
Circumference: $4\pi\sqrt{5}$

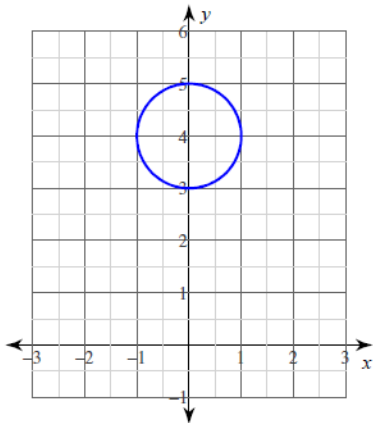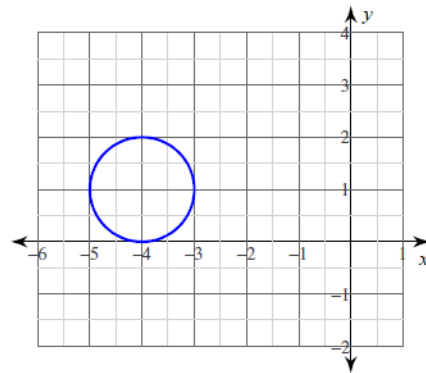36) Center: $(0, -13)$
Circumference: 6π

37) Center: $(11, -5)$
   Point on Circle: $(16, 0)$

38) Center: $(8, 16)$
   Point on Circle: $(7, 14)$

39)

40)

15.7) I can identify and write equations for parabolas from given characteristics and graphs

Notes on equations of parabolas:

Example Problems:

29) Vertex: $(7, -10)$, Focus: $\left(7, -\dfrac{81}{8}\right)$

30) Vertex: $(-5, 2)$, Focus: $\left(-5, \dfrac{11}{4}\right)$

31) Opens up or down, and passes through $\left(0, -\dfrac{19}{5}\right)$, $\left(1, -\dfrac{79}{20}\right)$, and $(2, -4)$

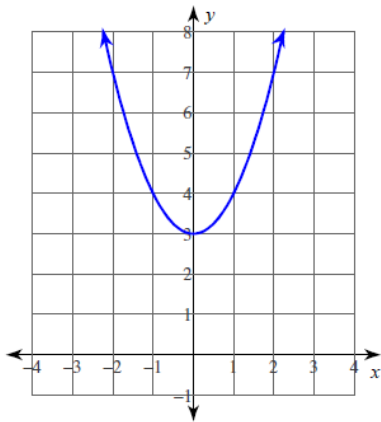32) Opens up or down, and passes through $(-2, -10)$, $(-8, -22)$, and $(-5, -7)$

33) Vertex: $(-7, -3)$, y-intercept: 95
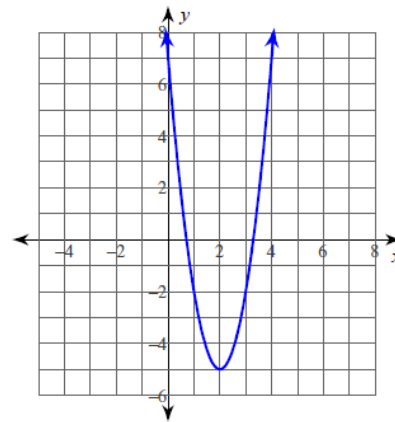
34) Vertex: $(-4, -7)$, y-intercept: -71

35) Opens up or down, Vertex: $(-4, -7)$, Passes through: $\left(-5, -\dfrac{27}{4}\right)$

36) Opens up or down, Vertex: $(4, 0)$, Passes through: $(6, 4)$

37)

38)

15.8) I can identify and write equations for ellipses from given characteristics and graphs

Notes of Writing equations of ellipses:

Sample Problems:

43) Center: $(-3, 5)$
  Focus: $(-3, 5 - 2\sqrt{6})$
  Height: 14

44) Center: $\left(-\dfrac{1}{2}, 3\right)$
  Focus: $\left(-\dfrac{1}{2}, 15\right)$
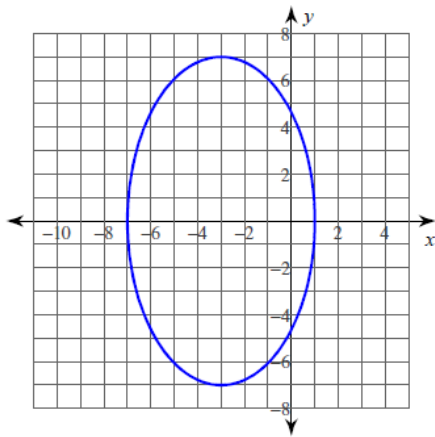 Width: 18

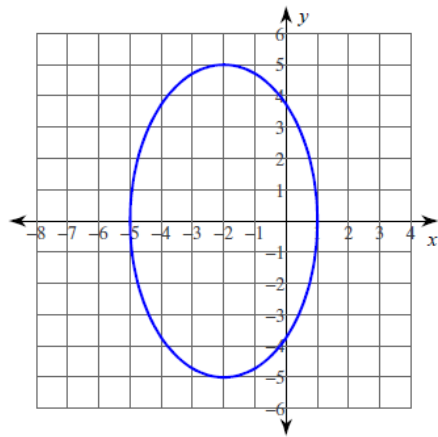39) Vertices: $(-4, 4), (-4, -18)$
    Foci: $\left(-4, -7 + \sqrt{57}\right), \left(-4, -7 - \sqrt{57}\right)$

40) Vertices: $(9, 6), (9, -10)$
    Foci: $\left(9, -2 + \sqrt{39}\right), \left(9, -2 - \sqrt{39}\right)$

41)

42)

15.9) I can identify and write equations for hyperbolas from given characteristics and graphs

Notes for Writing equations for hyperbolas:

Sample Problems:

45) Vertices: $(9, 15), (9, -11)$
 Endpoints of Conjugate Axis: $(18, 2)$
 $(0, 2)$

46) Vertices: $\left(3, 8 + \sqrt{105}\right), \left(3, 8 - \sqrt{105}\right)$
 Endpoints of Conjugate Axis: $\left(3 + \sqrt{110}, 8\right)$
 $\left(3 - \sqrt{110}, 8\right)$

47) Vertices: $(-7, 19), (-7, -9)$
 Foci: $\left(-7, 5 + \sqrt{317}\right), \left(-7, 5 - \sqrt{317}\right)$

48) Vertices: $\left(2, -4 + 2\sqrt{15}\right), \left(2, -4 - 2\sqrt{15}\right)$
 Foci: $\left(2, -4 + \sqrt{170}\right), \left(2, -4 - \sqrt{170}\right)$
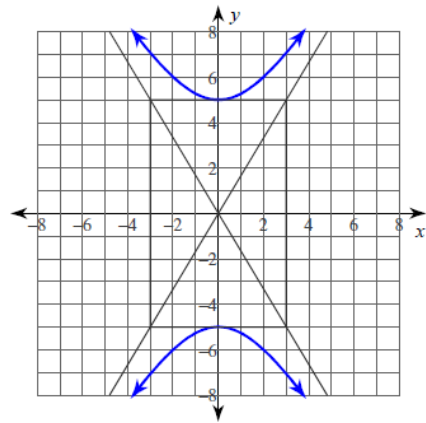
49)

50)

51) Center at $(1, 9)$
    Focus at $(1, 9 + 5\sqrt{5})$
    Eccentricity $= \dfrac{\sqrt{5}}{2}$

52) Center at $\left(\dfrac{1}{2}, 1\right)$
    Focus at $\left(\dfrac{1}{2}, 1 - \sqrt{221}\right)$
    Eccentricity $= \dfrac{\sqrt{221}}{11}$

15.10) I can identify conic sections and their properties (e.g., parabola, circle, ellipse, hyperbolas) from their equations in standard form

Notes for identifying Conics:

Sample Problems:

53) $\dfrac{x^2}{25} - \dfrac{(y-2)^2}{4} = 1$

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

55) $\dfrac{(x+1)^2}{9} + \dfrac{(y-2)^2}{16} = 1$

56) $(x+4)^2 + (y-1)^2 = 6$

57) $y = -2(x+3)^2 - 2$

58) $\dfrac{\left(x - \dfrac{7}{2}\right)^2}{4} + \dfrac{(y-1)^2}{36} = 1$