

**Find a positive and a negative coterminal angle for each given angle.**

1)  $-345^\circ$

2)  $150^\circ$

3)  $0^\circ$

4)  $45^\circ$

5)  $\frac{5\pi}{6}$

6)  $0$

7)  $-\frac{23\pi}{36}$

8)  $\frac{7\pi}{4}$

**Find a coterminal angle between  $0$  and  $2\pi$  for each given angle.**

9)  $\frac{55\pi}{18}$

10)  $\frac{371\pi}{90}$

11)  $-\frac{17\pi}{9}$

12)  $\frac{319\pi}{90}$

**Find a coterminal angle between  $0^\circ$  and  $360^\circ$ .**

13)  $1035^\circ$

14)  $438^\circ$

15)  $415^\circ$

16)  $705^\circ$

**State the quadrant in which the terminal side of each angle lies.**

17)  $\frac{13\pi}{18}$

18)  $-\frac{19\pi}{6}$

19)  $-\frac{\pi}{6}$

20)  $\frac{\pi}{4}$

**Find the reference angle.**

21)  $-\frac{22\pi}{9}$

22)  $\frac{23\pi}{6}$

23)  $\frac{7\pi}{12}$

24)  $\frac{8\pi}{9}$

25)  $590^\circ$

26)  $125^\circ$

27)  $-400^\circ$

28)  $380^\circ$

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

29) Center:  $(-12, -5)$   
Radius: 6

30) Center:  $(-7, 2)$   
Radius: 8

31)  $x^2 + y^2 + 30x - 8y + 237 = 0$

32)  $x^2 + y^2 - 32x + 247 = 0$

33) Center:  $(0, 15)$   
Point on Circle:  $(2, 17)$

34) Center:  $(-15, 17)$   
Point on Circle:  $(-14, 18)$

35) Center:  $(-7, 14)$   
Circumference:  $6\pi$

36) Center:  $(2, \sqrt{170})$   
Circumference:  $4\pi$

37) Center:  $(-14, 4)$   
Area:  $\pi$

38) Center:  $(-10, -2)$   
Area:  $25\pi$

Simplify. Write all answers in the  $a + bi$  form. Multiply the numerator and denominator by the conjugate of the denominator for #43-46.

39)  $(-6 - 8i)(1 + 4i)$

40)  $(5 + 5i)^2$

41)  $(-8 - 7i)(7 - 6i)$

42)  $(1 + 6i)(-7 - 5i)$

43)  $\frac{-10 - 4i}{-3 - i}$

44)  $\frac{7 + 4i}{6 - 6i}$

45)  $\frac{4 + 10i}{7 + 8i}$

46)  $\frac{-10 + 5i}{3 - 4i}$

**Simplify. Multiply the numerator and denominator by the conjugate of the denominator.**

47)  $\frac{5}{5\sqrt{10} + \sqrt{5}}$

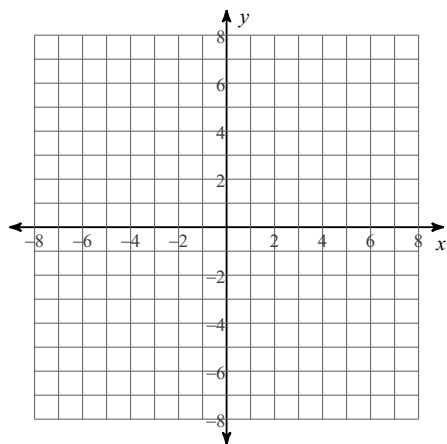
48)  $\frac{4}{10 + 7\sqrt{6}}$

49)  $\frac{10}{-2 - 3\sqrt{3}}$

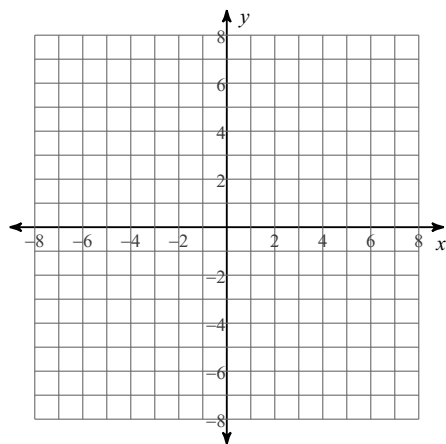
50)  $\frac{7}{-8 + \sqrt{2}}$

**Identify the center and radius of each. Then sketch the graph.**

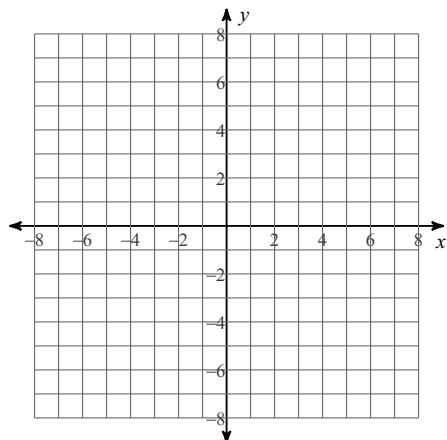
51)  $x^2 + y^2 - 4x - 4y - 8 = 0$



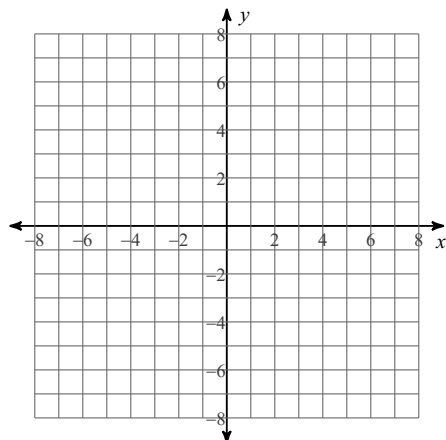
52)  $x^2 + y^2 + 6y = 0$



53)  $x^2 + y^2 - 4y - 12 = 0$



54)  $x^2 + y^2 + 8x - 6y + 21 = 0$



**Classify each conic section and write its equation in standard form. For circles, ellipses, and hyperbolas identify the center.**

55)  $-y^2 + x + 8y - 15 = 0$

56)  $-x^2 + y^2 - 6x - 4y - 9 = 0$

57)  $-16x^2 + y^2 + 128x - 2y - 271 = 0$

58)  $16x^2 - 9y^2 + 64x - 80 = 0$

59)  $x^2 + y^2 - 2y - 33 = 0$

60)  $25x^2 + 4y^2 + 250x - 16y + 541 = 0$

**Find a positive and a negative coterminal angle for each given angle.**

1)  $-345^\circ$

$15^\circ$  and  $-705^\circ$

2)  $150^\circ$

$510^\circ$  and  $-210^\circ$

3)  $0^\circ$

$360^\circ$  and  $-360^\circ$

4)  $45^\circ$

$405^\circ$  and  $-315^\circ$

5)  $\frac{5\pi}{6}$ ,  $\frac{17\pi}{6}$  and  $-\frac{7\pi}{6}$

6) 0

$2\pi$  and  $-2\pi$

7)  $-\frac{23\pi}{36}$ ,  $\frac{49\pi}{36}$  and  $-\frac{95\pi}{36}$

8)  $\frac{7\pi}{4}$ ,  $\frac{15\pi}{4}$  and  $-\frac{\pi}{4}$

**Find a coterminal angle between 0 and  $2\pi$  for each given angle.**

9)  $\frac{55\pi}{18}$ ,  $\frac{19\pi}{18}$

10)  $\frac{371\pi}{90}$ ,  $\frac{11\pi}{90}$

11)  $-\frac{17\pi}{9}$ ,  $\frac{\pi}{9}$

12)  $\frac{319\pi}{90}$ ,  $\frac{139\pi}{90}$

**Find a coterminal angle between  $0^\circ$  and  $360^\circ$ .**

13)  $1035^\circ$

$315^\circ$

14)  $438^\circ$

$78^\circ$

15)  $415^\circ$

$55^\circ$

16)  $705^\circ$

$345^\circ$

**State the quadrant in which the terminal side of each angle lies.**

17)  $\frac{13\pi}{18}$

II

18)  $-\frac{19\pi}{6}$

II

19)  $-\frac{\pi}{6}$

IV

20)  $\frac{\pi}{4}$

I

**Find the reference angle.**

21)  $-\frac{22\pi}{9}$ ,  $\frac{4\pi}{9}$

22)  $\frac{23\pi}{6}$ ,  $\frac{\pi}{6}$

23)  $\frac{7\pi}{12} - \frac{5\pi}{12}$

24)  $\frac{8\pi}{9} - \frac{\pi}{9}$

25)  $590^\circ - 50^\circ$

26)  $125^\circ - 55^\circ$

27)  $-400^\circ + 40^\circ$

28)  $380^\circ - 20^\circ$

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

29) Center:  $(-12, -5)$   
Radius: 6

$$(x + 12)^2 + (y + 5)^2 = 36$$

30) Center:  $(-7, 2)$   
Radius: 8

$$(x + 7)^2 + (y - 2)^2 = 64$$

31)  $x^2 + y^2 + 30x - 8y + 237 = 0$

$$(x + 15)^2 + (y - 4)^2 = 4$$

32)  $x^2 + y^2 - 32x + 247 = 0$

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

33) Center:  $(0, 15)$   
Point on Circle:  $(2, 17)$

$$x^2 + (y - 15)^2 = 8$$

34) Center:  $(-15, 17)$   
Point on Circle:  $(-14, 18)$

$$(x + 15)^2 + (y - 17)^2 = 2$$

35) Center:  $(-7, 14)$   
Circumference:  $6\pi$

$$(x + 7)^2 + (y - 14)^2 = 9$$

36) Center:  $(2, \sqrt{170})$   
Circumference:  $4\pi$

$$(x - 2)^2 + (y - \sqrt{170})^2 = 4$$

37) Center:  $(-14, 4)$   
Area:  $\pi$

$$(x + 14)^2 + (y - 4)^2 = 1$$

38) Center:  $(-10, -2)$   
Area:  $25\pi$

$$(x + 10)^2 + (y + 2)^2 = 25$$

Simplify. Write all answers in the  $a + bi$  form. Multiply the numerator and denominator by the conjugate of the denominator for #43-46.

39)  $(-6 - 8i)(1 + 4i)$   
 $26 - 32i$

40)  $(5 + 5i)^2$   
 $50i$

41)  $(-8 - 7i)(7 - 6i)$   
 $-98 - i$

42)  $(1 + 6i)(-7 - 5i)$   
 $23 - 47i$

$$43) \frac{-10 - 4i}{-3 - i} \frac{17}{5} + \frac{i}{5}$$

$$44) \frac{7 + 4i}{6 - 6i} \frac{1}{4} + \frac{11i}{12}$$

$$45) \frac{4 + 10i}{7 + 8i} \frac{108}{113} + \frac{38i}{113}$$

$$46) \frac{-10 + 5i}{3 - 4i} \\ -2 - i$$

**Simplify. Multiply the numerator and denominator by the conjugate of the denominator.**

$$47) \frac{5}{5\sqrt{10} + \sqrt{5}} \frac{5\sqrt{10} - \sqrt{5}}{49}$$

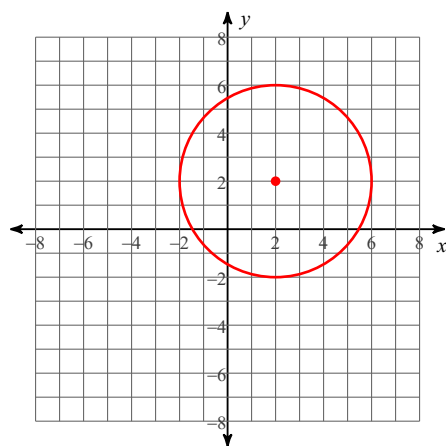
$$48) \frac{4}{10 + 7\sqrt{6}} \frac{-20 + 14\sqrt{6}}{97}$$

$$49) \frac{10}{-2 - 3\sqrt{3}} \frac{20 - 30\sqrt{3}}{23}$$

$$50) \frac{7}{-8 + \sqrt{2}} \frac{-56 - 7\sqrt{2}}{62}$$

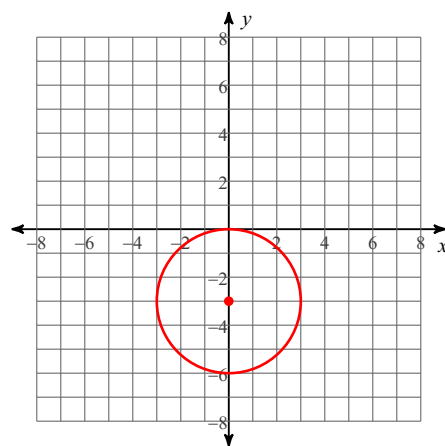
**Identify the center and radius of each. Then sketch the graph.**

$$51) x^2 + y^2 - 4x - 4y - 8 = 0$$



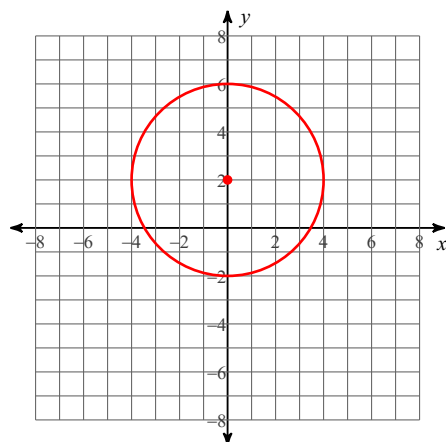
Center: (2, 2)  
Radius: 4

$$52) x^2 + y^2 + 6y = 0$$



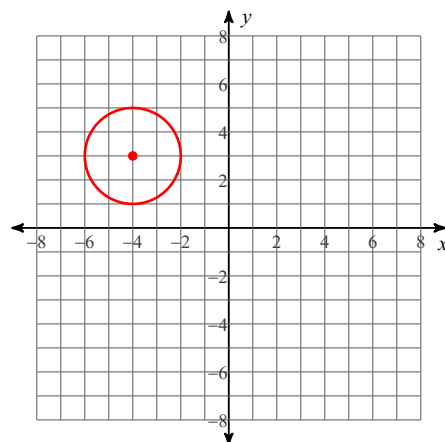
Center: (0, -3)  
Radius: 3

$$53) x^2 + y^2 - 4y - 12 = 0$$



Center: (0, 2)  
Radius: 4

$$54) x^2 + y^2 + 8x - 6y + 21 = 0$$



Center: (-4, 3)  
Radius: 2

**Classify each conic section and write its equation in standard form. For circles, ellipses, and hyperbolas identify the center.**

55)  $-y^2 + x + 8y - 15 = 0$

Parabola

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

56)  $-x^2 + y^2 - 6x - 4y - 9 = 0$

Hyperbola

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

Center:  $(-3, 2)$

57)  $-16x^2 + y^2 + 128x - 2y - 271 = 0$

Hyperbola

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

Center:  $(4, 1)$

58)  $16x^2 - 9y^2 + 64x - 80 = 0$

Hyperbola

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

Center:  $(-2, 0)$

59)  $x^2 + y^2 - 2y - 33 = 0$

Circle

$$x^2 + (y - 1)^2 = 34$$

Center:  $(0, 1)$

60)  $25x^2 + 4y^2 + 250x - 16y + 541 = 0$

Ellipse

$$\frac{(x + 5)^2}{4} + \frac{(y - 2)^2}{25} = 1$$

Center:  $(-5, 2)$