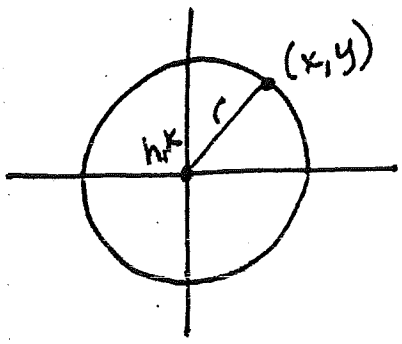
H.W p. 991-2
11-23 odd
29-33 odd

Circles

Circle = set of all points on a plane that are equidistant from a fixed point.

The fixed point is called the center (h, k).

The distance is called the radius.



← use the distance formula

$$r = \sqrt{(x-h)^2 + (y-k)^2}$$

$$r^2 = (x-h)^2 + (y-k)^2$$ ← square both sides

[if center is (0,0)]

↓

$$r^2 = x^2 + y^2$$

example:

$(x-3)^2 + (y+2)^2 = 16$ ← Standard Form

$(x-h)^2 + (y-K)^2 = r^2$

center: $(3, -2)$

radius: 4

example:

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

center: $(0, 5)$

radius: 5

↓

$(x-3)^2 + (y+2)^2 = 16$

Convert to General Form

↓

$x^2 - 6x + 9 + y^2 + 4y + 4 = 16$

$x^2 - 6x + y^2 + 4y + 13 = 11$

$-13 \quad -1$

$x^2 + y^2 - 6x + 4y = 3$

$x^2 + y^2 - 6x + 4y - 3 = 0$

↑

General Form

$-\frac{6}{2} = (-3)^2$ $\quad \frac{4}{2} = (2)^2$

How do you take an equation in general form and convert it to standard form so that you can graph it?

example: $x^2 + y^2 - 6x + 4y - 3 = 0$ General form ↓ Standard form

$x^2 - 6x + \underline{9} + y^2 + 4y + \underline{4} = 3 + 9 + 4$

$(x-3)^2 + (y+2)^2 = 16$

center: $(3, -2)$ $\quad r = 4$

example: $\frac{3x^2}{3} + \frac{3y^2}{3} + \frac{12x}{3} + \frac{12}{3} = \frac{18y}{3}$

$x^2 + y^2 + 4x + 4 = 6y$

$x^2 + 4x + \underline{4} + y^2 - 6y + \underline{9} = -4 + \underline{4} + 9$

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

center $(-2, 3)$ $\quad r = 3$

example: Find the equation of a circle w/ center $(-1, -3)$ passing through $(-4, -2)$

$(-1, -3)$: h, k $\quad (-4, -2)$: x, y

$(x-h)^2 + (y-k)^2 = r^2$

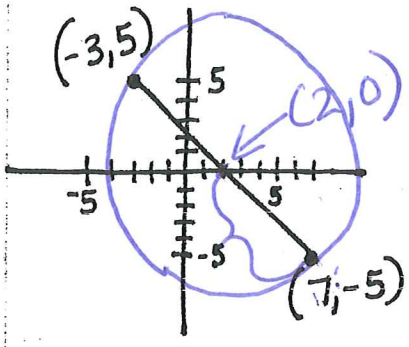
$(-4 + 1)^2 + (-2 + 3)^2 = r^2$

$9 + 1 = r^2$

$10 = r^2$

$(x+1)^2 + (y+3)^2 = 10$

example: Find the equation with endpoints of a diameter $(-3, 5)$ and $(7, -5)$



$r = 5\sqrt{2}$

$r^2 = 50$

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

$$d = \sqrt{(7 - -3)^2 + (-5 - 5)^2}$$

$$d = \sqrt{(10)^2 + (-10)^2}$$

$$d = \sqrt{100 + 100}$$

$$d = \sqrt{200}$$

$$d = \frac{10\sqrt{2}}{2}$$

The radius is $\frac{1}{2}$ of $10\sqrt{2}$ $\quad r = 5\sqrt{2}$

Now find the midpoint because this is the center point

Midpoint: $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$$\left(\frac{-3+7}{2}, \frac{5+-5}{2}\right)$$

$$\left(\frac{4}{2}, \frac{0}{2}\right)$$

center: $(2, 0)$

$$(x-2)^2 + y^2 = (5\sqrt{2})^2$$

$$(x-2)^2 + y^2 = 50$$

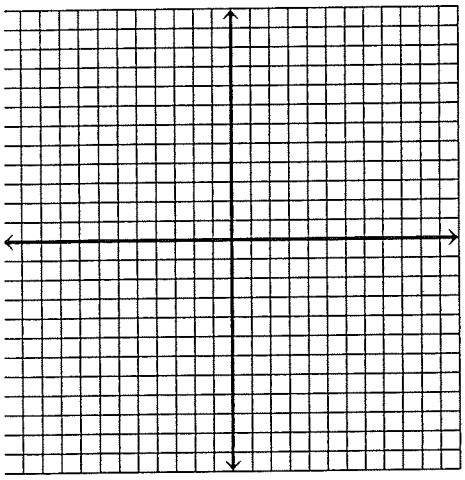
Pre Calc Circles Name_____

In Exercises 11–14, find the equation of the circle with given center and radius r.

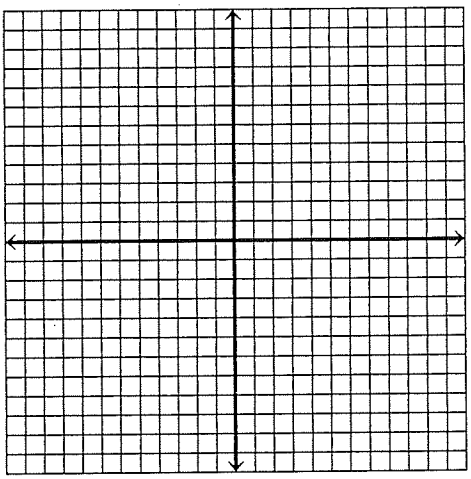
11. $(-3, 4)$; $r = 2$ 12. $(-2, -1)$; $r = 3$ 13. $(0, 0)$; $r = \sqrt{2}$ 14. $(5, -2)$; $r = 1$

In Exercises 15–18, sketch the graph of the equation.

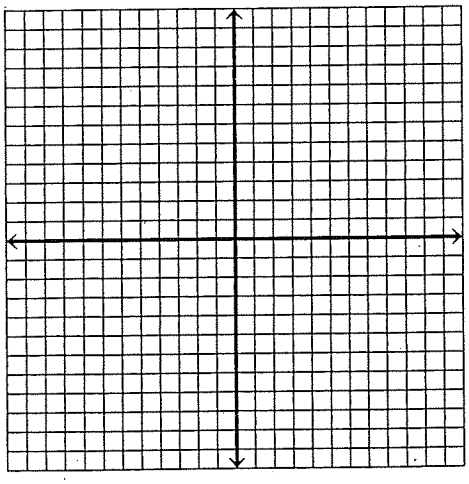
15. $(x - 2)^2 + (y - 4)^2 = 1$



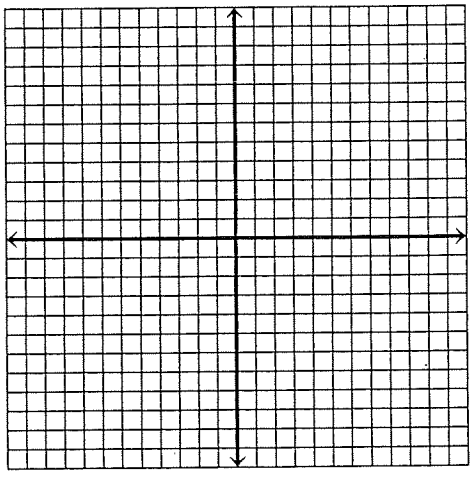
16. $(x + 1)^2 + (y - 3)^2 = 9$



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



18. $(x + 6)^2 + y^2 = 4$



In Exercises 19–24, find the center and radius of the circle whose equation is given.

19. $x^2 + y^2 + 8x - 6y - 15 = 0$

21. $x^2 + y^2 + 6x - 4y - 15 = 0$

23. $x^2 + y^2 + 25x + 10y = -12$

In Exercises 29–36, find the equation of the circle.

29. Center (2, 2); passes through the origin.

31. Center (1, 2); intersects x-axis at -1 and 3.

33. Center $(-5, 4)$; tangent (touching at one point) to the x-axis.