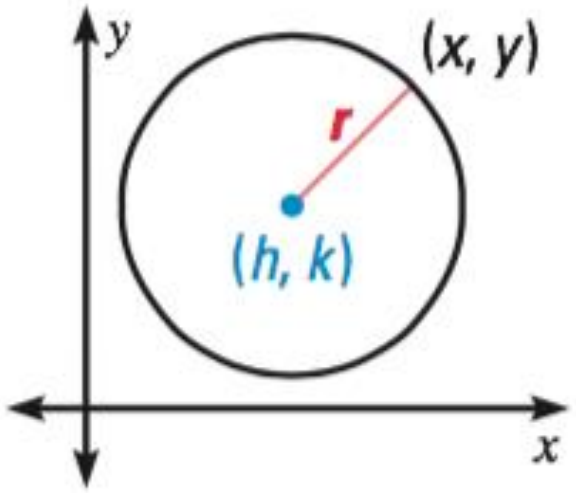
Chapter 10
Circles

Section 6
Equations of Circles

GOAL 1: Finding Equations of Circles

You can write an equation of a circle in a coordinate plane if you know its radius and the coordinates of its center. Suppose the radius of a circle is r and the center is (h, k). Let (x, y) be any point on the circle. The distance between (x, y) and (h, k) is r, so you can use the Distance Formula.



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

Square both sides to find the **standard equation of a circle** with radius r and center (h, k).

Standard equation of a circle: $(x-h)^2+(y-k)^2 = r^2$

If the center is the origin, then the standard equation is $x^2 + y^2 = r^2$.

Example 1: Writing a Standard Equation of a Circle

Write the standard equation of the circle with center (-4, 0) and radius 7.1.

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

$$(x--4)^2+(y-0)^2=7.1^2$$

$$(x+4)^2+y^2=50.41$$

Example 2: Writing a Standard Equation of a Circle

* on quiz!

The point (1, 2) is on a circle whose center is (5, -1). Write the standard equation of the circle.

radius

$r = \sqrt{(1-5)^2 + (2-{-1})^2} \rightarrow \sqrt{16+9} \rightarrow \sqrt{25} = 5$

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

$(x-5)^2 + (y-{-1})^2 = 5^2$

$(x-5)^2 + (y+1)^2 = 25$

GOAL 2: Graphing Circles

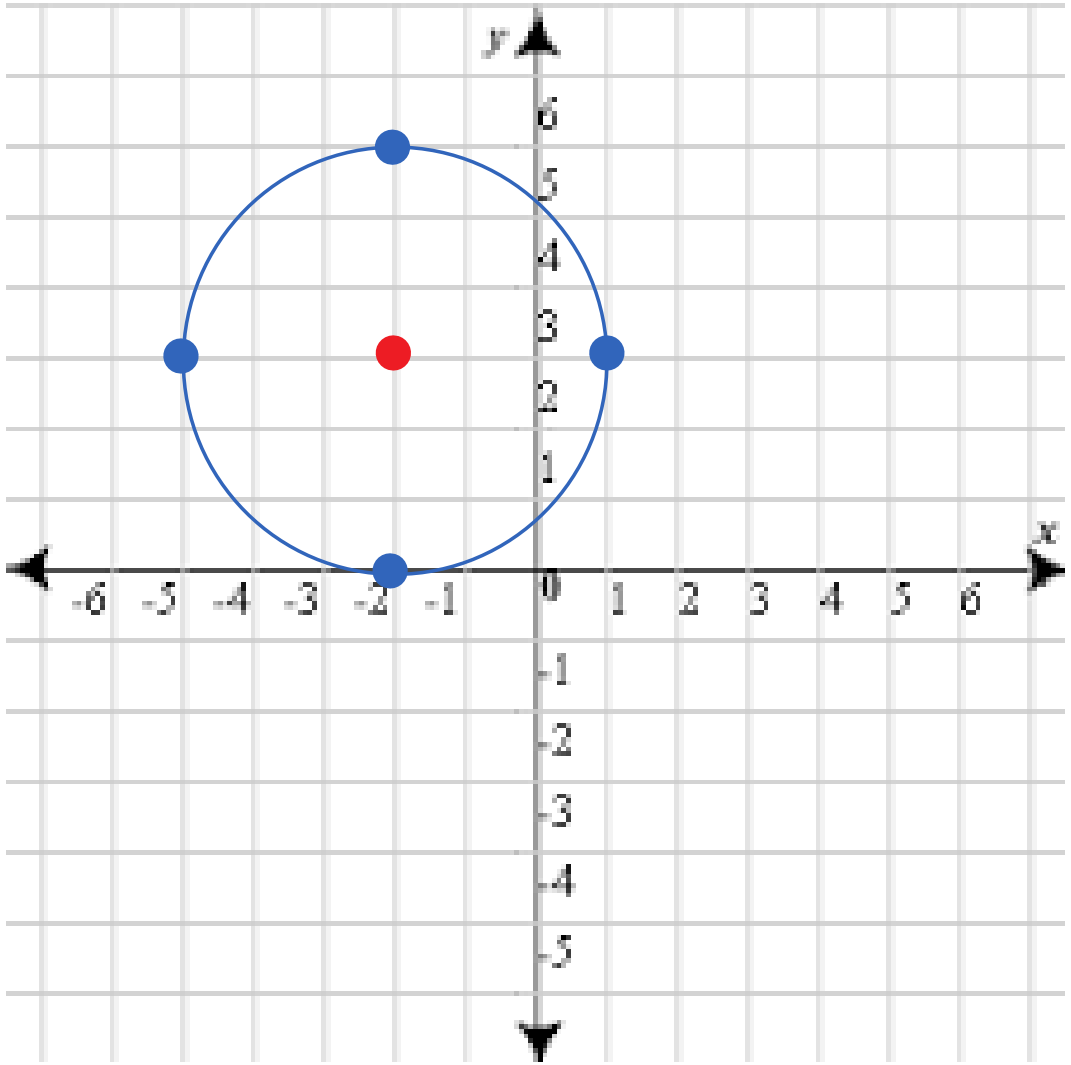
If you know the equation of a circle, you can graph the circle by identifying the center and radius.

Example 3: Graphing a Circle

The equation of a circle is $(x + 2)^2 + (y - 3)^2 = 9$. Graph the circle.

center: $(-2, 3)$

$r^2 = 9 \rightarrow r = 3$



Example 4: Applying Graphs of Circles

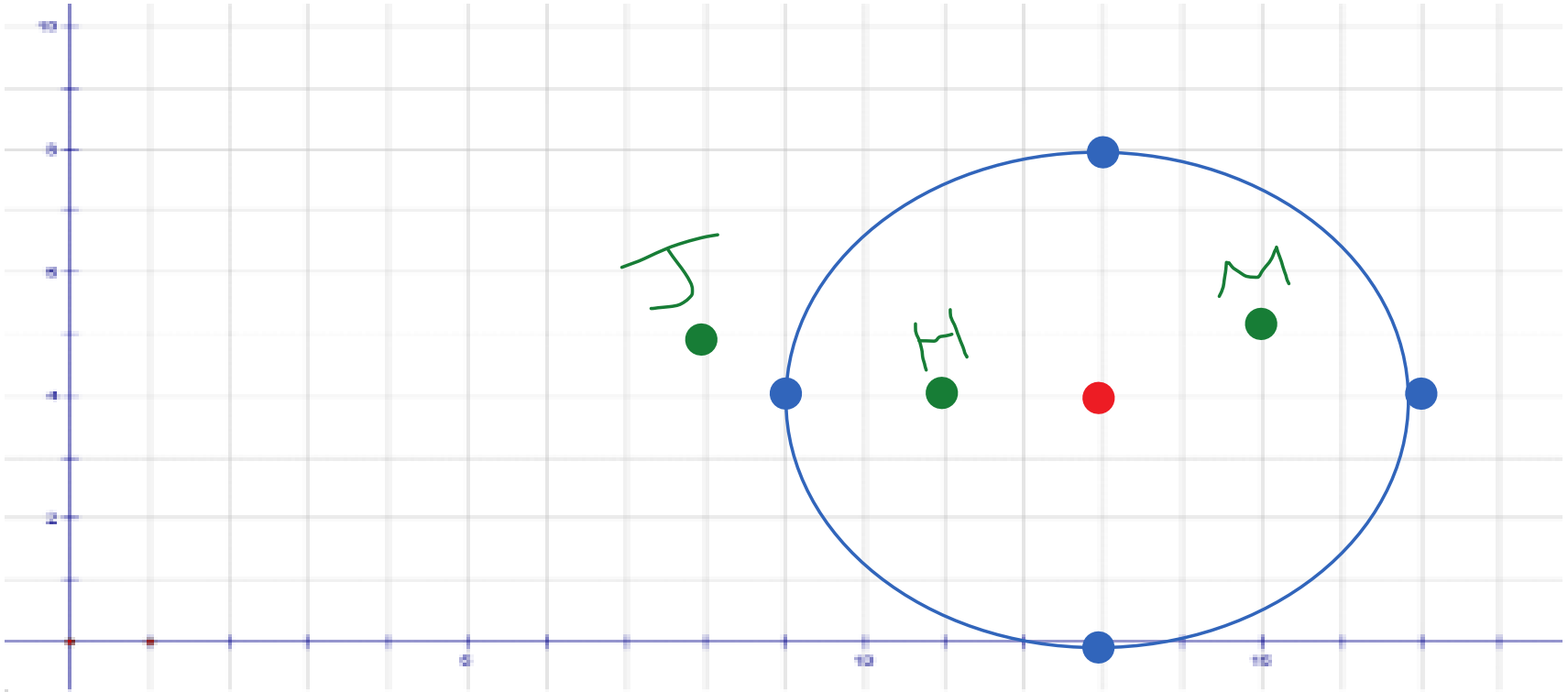
THEATER LIGHTING A bank of lights is arranged over a stage. Each light illuminates a circular area on the stage. A coordinate plane is used to arrange the lights, using the corner of the stage as the origin. The equation $(x - 13)^2 + (y - 4)^2 = 16$ represents one of the disks of light.

center: (13,4)

$r^2 = 16 \rightarrow r = 4$

a. Graph the disk of light.

b. Three actors are located as follows: Henry is at (11, 4), Jolene is at (8, 5), and Martin is at (15, 5). Which actors are in the disk of light?



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