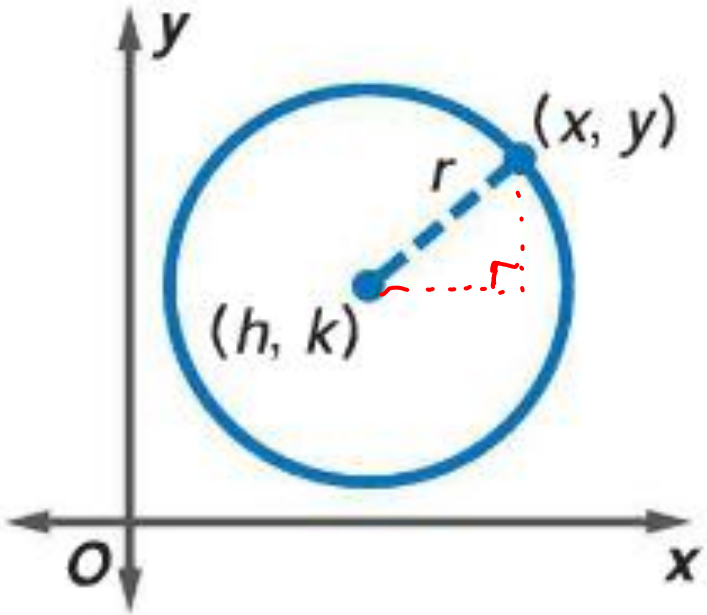
# Equations of Circles

# Equation of a Circle in Standard Form

The standard form of the equation of a circle with center at $(h,k)$ and radius $r$ is

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



# Examples

Write the equation of the circle.

center at (1,-8), radius 7

h k r

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

$$(x-1)^2+(y+8)^2=7^2$$

# Examples

Write the equation of the circle.

center at (1,-8), radius 7

$h = 1, k = -8, r = 7$

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

$(x - 1)^2 + (y + 8)^2 = 49$

# Examples

Write the equation of the circle.

center at (4, -1), diameter 8

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

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

# Examples

Write the equation of the circle.

center at (4,-1), diameter 8

$h = 4, k = -1, r = 4$

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

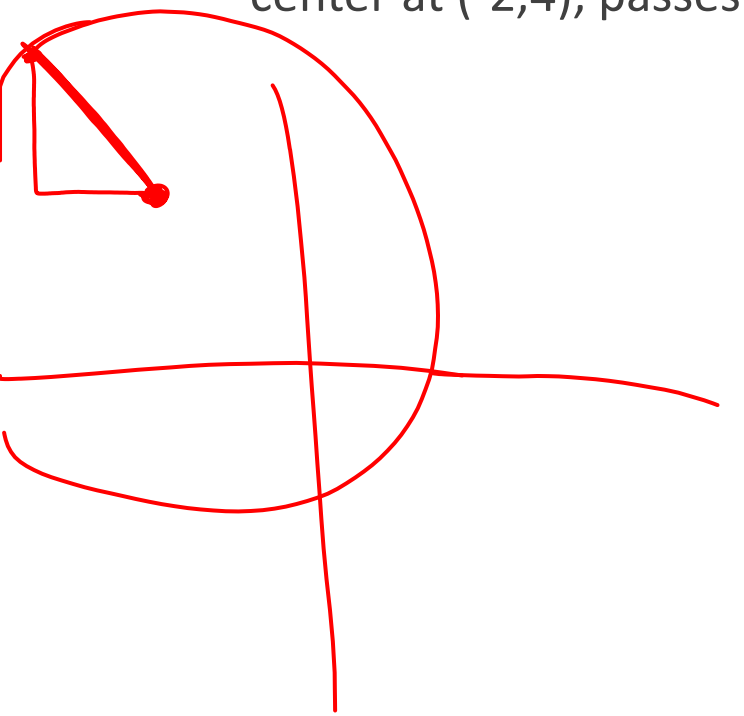
$(x - 4)^2 + (y + 1)^2 = 16$

$4^2 + 3^2 = 5^2$

# Examples

Write the equation of the circle.

center at (-2,4), passes through point (-6,7)



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

$(x+2)^2 + (y-4)^2 = 25$

# Examples

Write the equation of the circle.

center at (-2,4), passes through point (-6,7)

$h = -2, k = 4, r = 5$ radius: 4 units in x-direction, 3 units in y-direction

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

$(x + 2)^2 + (y - 4)^2 = 25$

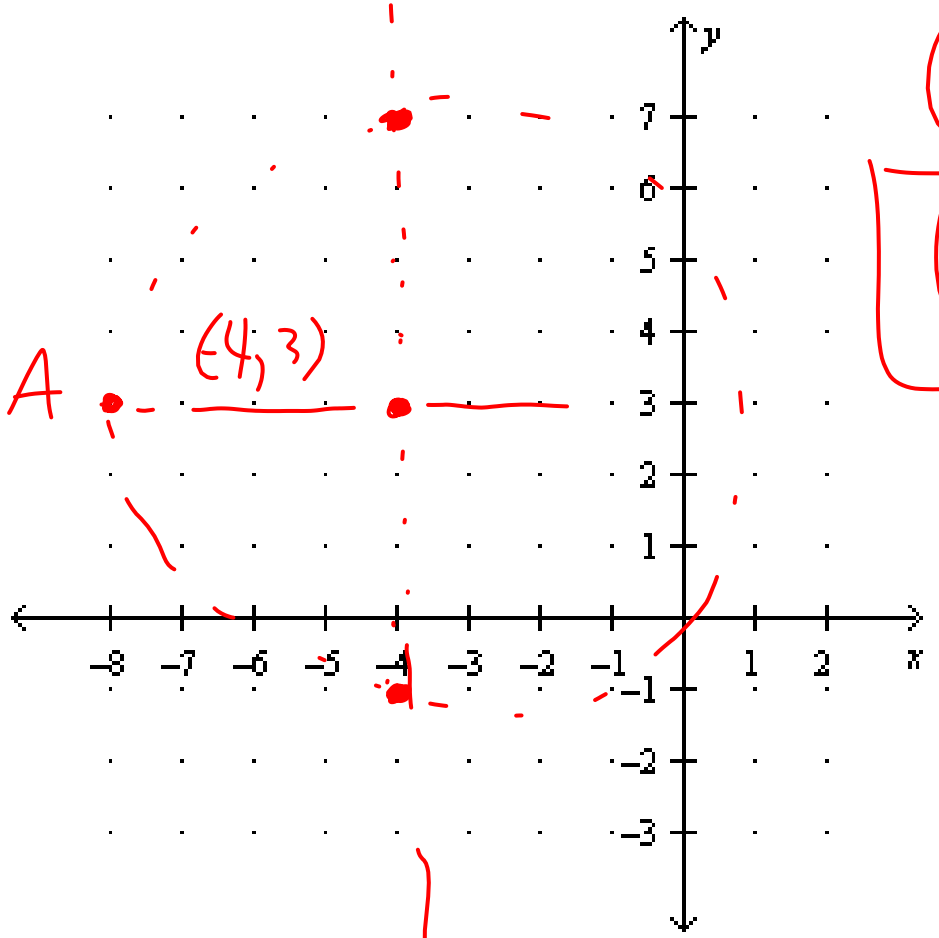
# Examples

Three tornado sirens are placed strategically around a town so they can be heard by all. Write the equation of the circle if the coordinates of the sirens are *A*(-8,3), *B*(-4,7), and *C*(-4,-1).

# Examples

h, k

(-4, 3)




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

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

# Examples

Find the point(s) of intersection between

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

$\sqrt{r^2} = \sqrt{4}$

$r = 2$

$x^2 + x^2 = 4$

$\frac{2x^2}{2} = \frac{4}{2}$

$\sqrt{x^2} = \sqrt{2}$

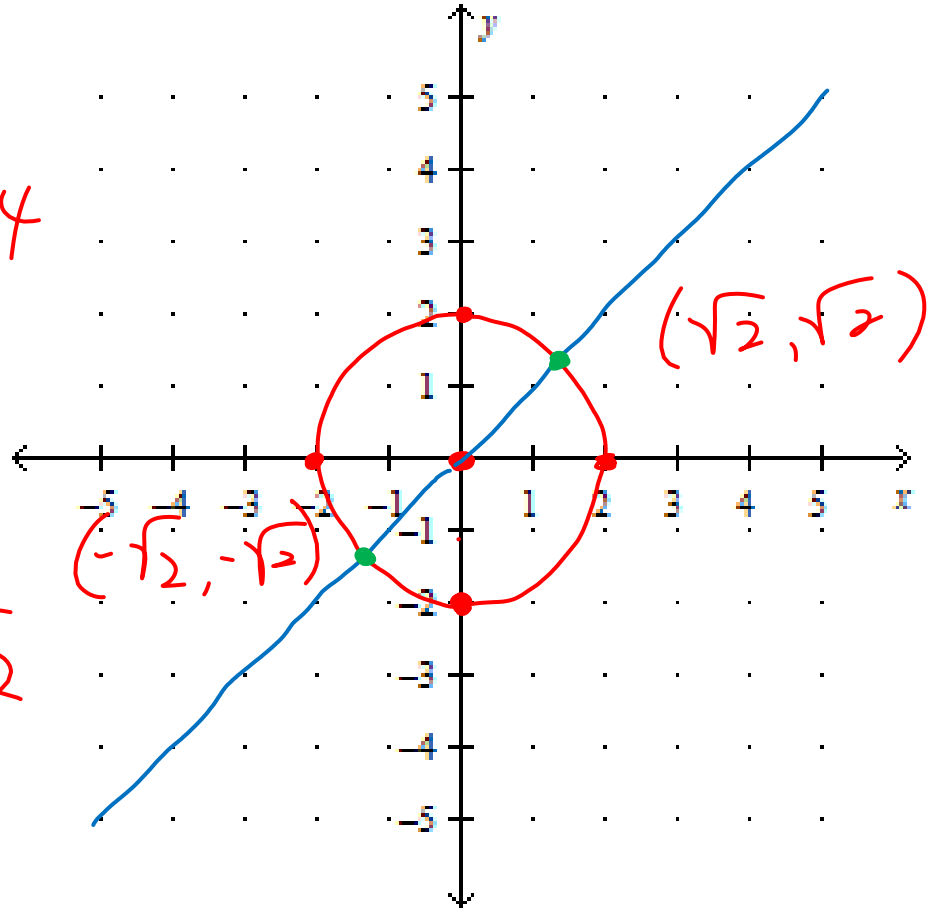
$x = \pm\sqrt{2}$

$y^2 + y^2 = 4$

$\frac{2y^2}{2} = \frac{4}{2}$

$\sqrt{y^2} = \sqrt{2}$

$y = \pm\sqrt{2}$



# Examples

Find the point(s) of intersection between

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

| | |
|---|---|
| $x^2 + x^2 = 4$ | substitute y = x |
| $2x^2 = 4$ | add |
| $x^2 = 2$ | divide both sides by 2 |
| $\sqrt{x^2} = \pm\sqrt{2}$ | take square roots |
| $x = \pm\sqrt{2}$ | simplify |