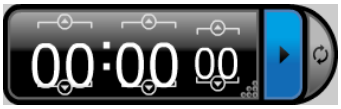
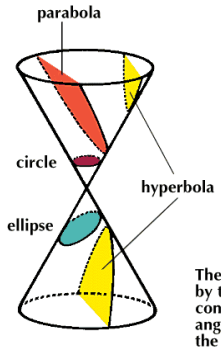
# Circles

**EQ:** How do I write the equation of a circle in standard form?

Turn in logs extra credit right now!!! We are starting notes when the timer goes off.




Congrats to Frankie, Grant, & George (3rd) and Ian & Jordan (6th) for winning people's choice on their project!




The kind of conic section produced by the intersection of a plane and conical surface is determined by the angle at which the plane intersects the surface.

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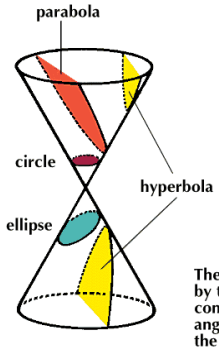


The kind of conic section produced by the intersection of a plane and conical surface is determined by the angle at which the plane intersects the surface.

**Generating the Conic Sections**

**The "standard" conic sections are curves of intersection of a plane with a double cone.**

**This animation shows the 3-D image of the intersection of the plane and double cone and a 2-D image of the curve of intersection.**

*From Calculus Animations with Mathcad by P. Bogacki and G. Melrose.*

*Used with permission.*

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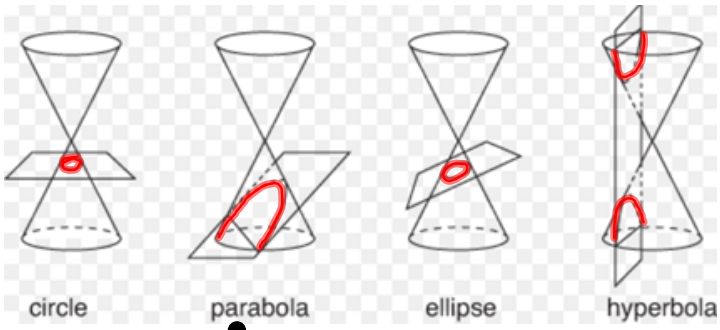
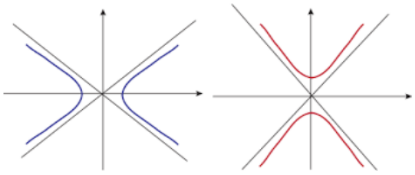



Circle: Parallel to base

Parabola: at an angle through base

Ellipse: at an angle, not through base

Hyperbola: Perpendicular to base

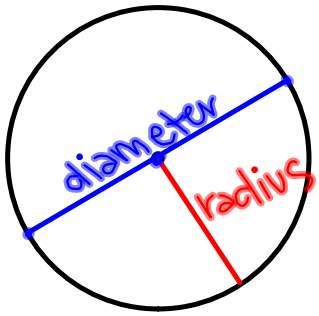


# Circles

**EQ:** How do I write the equation of a circle in standard form?

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

center: (h,k)
radius: r

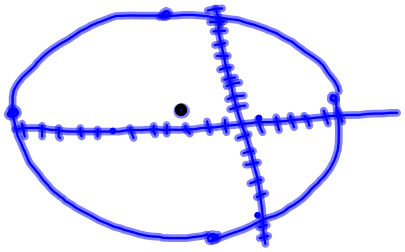



**ex. Find the center and radius and draw a graph.**

A. $(x+3)^2+(y-1)^2=81$

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

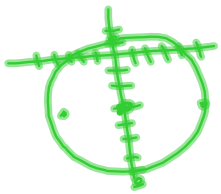
center: (-3,1)
radius: $\sqrt{81}=9$



B. $x^2+(y+3)^2=24$

$(x-h)^2$

center: (0,-3)
radius: $\sqrt{24}\approx 4.9$



# Circles

**EQ:** How do I write the equation of a circle in standard form?

**ex 2.** Write the equation of the circle: Center (2, -4) radius = $3\sqrt{5}$

$(x-2)^2+(y+4)^2=(3\sqrt{5})^2$

45

**General Form** $Ax^2+Cy^2+Dx+Ey+F=0$

**Complete the square to write in standard form.**

A. $x^2+y^2-10x+12y+45=0$

$(x^2-10x+25)+(y^2+12y+36)=-45+25+36$

$(\frac{-10}{2})^2=(-5)^2$ $(\frac{12}{2})^2=(6)^2$

$-5\times -5=25$ $6\times 6=36$ $(x-5)(x-5)$ $(y+6)(y+6)$

$(x-5)^2+(y+6)^2=16$

Complete the square TWICE
- Group the x's
- Group the y's
- Move the constant

B. $x^2+y^2-2x+16y=56$

$(x^2-2x+1)+(y^2+16y+64)=56+1+64$

$(\frac{-2}{2})^2=(-1)^2$ $(\frac{16}{2})^2=64$

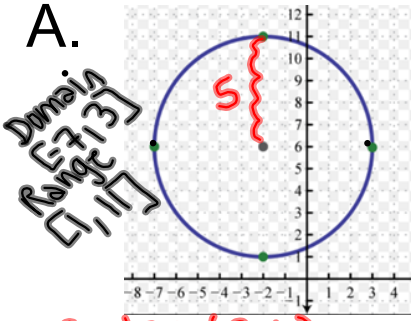
$(x-1)^2+(y+8)^2=121$

# Circles

**EQ:** How do I write the equation of a circle in standard form?

## Write the equation of the circle:

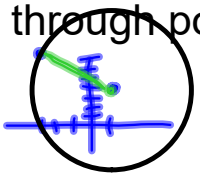
A.




Center (-2,6)
radius 5

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

B. Center (1,4) and through point (-3,7)



$(x_1, y_1)$ $(x_2, y_2)$

Radius

$\sqrt{(-3-1)^2+(7-4)^2}$

$=\sqrt{25}=5$

$(x-1)^2+(y-4)^2=5^2$

C. Diameter end points (-1,1) and (7,9)

Radius x2

$(x_1, y_1)$

center midpt

$\left(\frac{-1+7}{2}, \frac{1+9}{2}\right)$ $(x_2, y_2)$

$\left(\frac{6}{2}, \frac{10}{2}\right) \rightarrow (3,5)$

radius

$\sqrt{(5-1)^2+(3+1)^2}$

$\sqrt{32}$

$(x-3)^2+(y-5)^2=(\sqrt{32})^2$

$(x-3)^2+(y-5)^2=32$

## Other Important Formulas

AREA

$$A=\pi r^2$$

MIDPOINT

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

(Center of 2 points)

DISTANCE

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

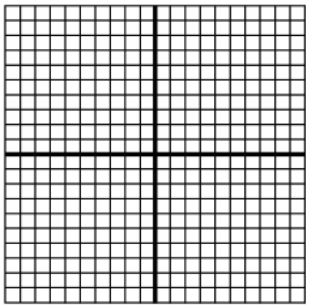
(find radius)

**Practice – Circles – Day 1**

Name _____ Date _____ Period _____

Graph the following equations and state the domain and range:

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



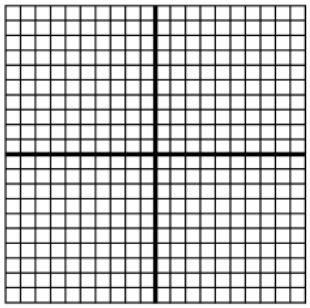
Center:

Radius:

Domain:

Range:

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



Center:

Radius:

Domain:

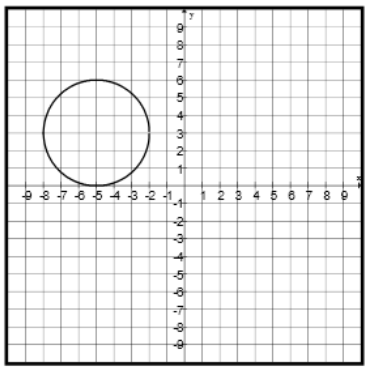
Range:

Write the equation of the circles then state their domain and range:

3. Center (-4, -5), Radius = $\sqrt{13}$

4. Center $\left(\frac{2}{3}, \frac{5}{8}\right)$ and an area of $49\pi$.

5.

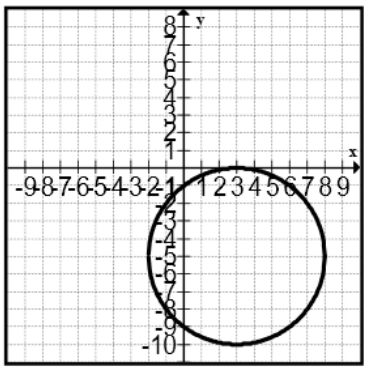


_____

_____

_____

6.



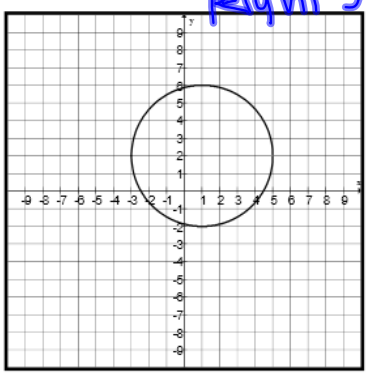
_____

_____

_____

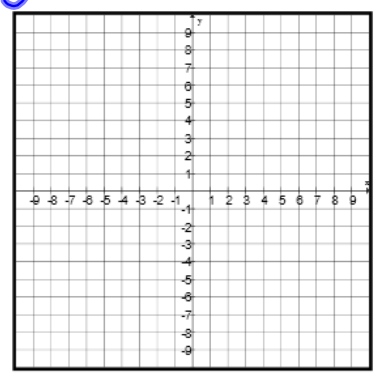
7. Given Circle P, write the equation of the circle. Then graph and write the equation of a new circle Q that is transformed $f(x-3)-5$.

P



Right 3 Down 5

Q



Equation of Circle P _____

Domain: _____

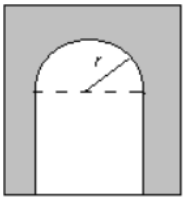
Range: _____

Equation of Circle Q _____

Domain: _____

Range: _____

8. The face of a one lane tunnel in the figure is a square with a semi-circle above it. The semi-circle can be described by the equation $x^2 + y^2 = 81$. A truck 15 feet wide and 22 feet tall tries to drive through the tunnel. Will it make it? Justify your answer!



9. Find the center and radius of the following circle $x^2 + (y+3)^2 = 9$

10. Find the equation of the circle with center (-1, 3) and containing the point (-5, 6).

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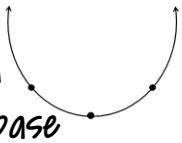
Parabola: at an angle through base

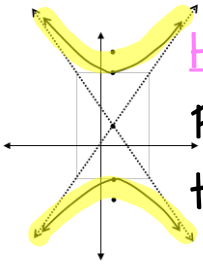


Circle: Parallel to base

## Unit 11

## Conics

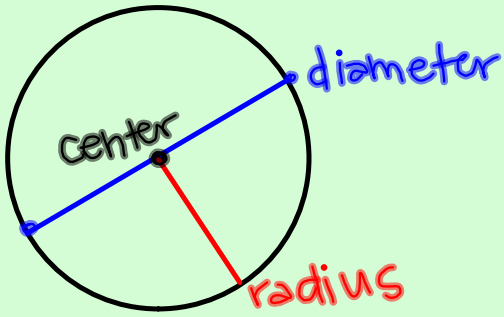
Ellipse: at an angle, not through base



Hyperbola: Perpendicular to base

# Circles

**EQ:** How do I write the equation of a circle in standard form?




radius : r
center : (h, k)

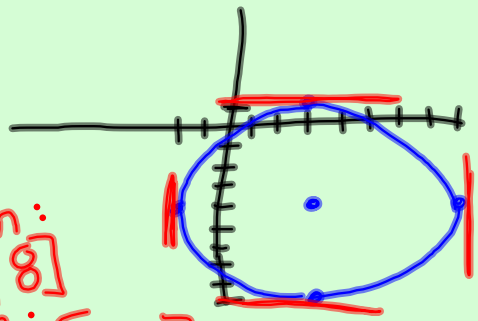
## Standard Form

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

## ex. Graph

$$(x-3)^2+(y+4)^2=25$$

center (3, -4)
radius $\sqrt{25}=5$



Domain: [-2, 8]
Range: [-9, 1]

## Other Important Formulas

Area:
$$A=\pi r^2$$

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

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

# Circles

**EQ:** How do I write the equation of a circle in standard form?

**ex.** Write the equation of the circle:
Center (6, -5) radius = 4

h k

$(x-6)^2+(y+5)^2=4^2$

**ex.** Write the equation of the circle:
Center (3, 2) radius = $3\sqrt{2}$

$(3\sqrt{2})^2$

$3^2(\sqrt{2})^2$

$9\cdot 2$

$(x-3)^2+(y-2)^2=(3\sqrt{2})^2$

$\boxed{(x-3)^2+(y-2)^2=18}$

h k

**ex.** Write the equation of the circle with center (1, 3) that passes through (4,7)

x y


(1, 3) (4, 7)

$x_1\ y_1$ $x_2\ y_2$

$d=\sqrt{(4-1)^2+(7-3)^2}$

$=\sqrt{3^2+4^2}=\sqrt{9+16}=\sqrt{25}$

OR $(4-1)^2+(7-3)^2=r^2$

$\boxed{(x-1)^2+(y-3)^2=5^2}$

**General Form** $Ax^2+Cy^2+Dx+Ey+F=0$

↳ circle A = C

**ex.** $x^2+y^2-10x+12y+45=0$

$-45\ \ -45$

$(x^2-10x+25)+(y^2+12y+36)=-45+25+36$

$\left(\frac{-10}{2}\right)^2$ $\left(\frac{12}{2}\right)^2$

$(x-5)^2+(y+6)^2=16$

center: $(5,-6)$

radius: 4

Complete the square TWICE

- Group the x's
- Group the y's
- Move the constant (other side)

# Circles

## Warm-Up Monday

https://goo.gl/7vwzzw

(https://padlet.com/Korotkow/Prom2k17)

Go to the padlet and show me your prom pics!

If you didn't go to prom, tell me what you did this weekend :) (pics not required)