CIRCLES

GOALS

- USE THE STANDARD AND GENERAL FORMS OF THE EQUATION OF A CIRCLE
- GRAPH CIRCLES

Definitions

- **<u>Locus-</u>** a set of points that satisfy a given set of conditions.
- **<u>Circle-</u>**is the locus of all points in a plane at a given distance from a fixed point on the plane.
- **<u>Center-</u>** the fixed point

Definitions

- **Radius-**the distance from any point on the circle to the center
- **Concentric Circles-** circles that have the same center, but not the same radius
- LOOK on page 623.

Standard Form

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

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

General Form

- The general form of the equation of a circle is

$$x^2 + y^2 + Dx + Ey + F = 0$$

where D, E, and F are constants.

Example 1

- Write the equation of the circle with center at (4, -1) and a radius of 6 units. Then Graph the equation.

- Hint Zoom 5.

Example 1

- Plug radius and center into Standard form.

- r=6

- Center at (4,-1)

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

Example 1

$$(x-4)^2 + (y+1)^2 = 36$$

```
WINDOW
 Xmin=■12
 Xmax=12
 Xscl=1
 Ymin=-8
 Ymax=8
 Yscl=1
 Xres=1
```

```
X=  Plot1   Plot2   Plot3
\Y1■-1+√(36-(X-4
)²
\Y2■-1-√(36-(X-4
)²
\Y3=
\Y4=
```
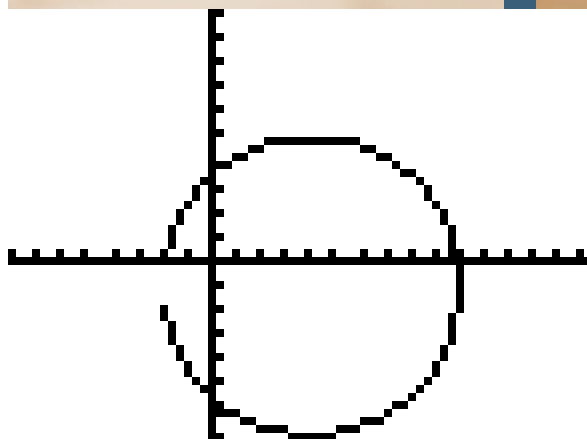
Example 2

- The equation of a circle is

$$4x^2 + 4y^2 - 24x + 16y = -51$$

- Find the radius and coordinates of the center. Then Graph the equation.

Example 2

- Complete the squares!!! (§4-2)

$$(4x^2 - 24x + ?) + (4y^2 + 16y + ?) = -51$$

- Divide by 4.

$$(x^2 - 6x + ?) + (y^2 + 4y + ?) = -51/4$$

Example 2

$$(x^2 - 6x + 9) + (y^2 + 4y + 4) = 13 - 51/4$$

$$(x - 3)^2 + (y + 2)^2 = 1/4$$

Radius = ½   Center at (3, -2)

Example 2

- To Graph. Solve for y.

Example 3

- Find the equation of the circle that passes thru (0,-1), (2,1) and (4, -1). Then identify the center and the radius of the circle.

Example 3

- Substitute each ordered pair into the general form for a circle.

- Use matrices to solve the system.

- Complete the squares!!!!

Example 3

$$(0)^2 + (-1)^2 + D(0) + E(-1) + F = 0$$

$$(2)^2 + (1)^2 + D(2) + E(1) + F = 0$$

$$(4)^2 + (-1)^2 + D(4) + E(-1) + F = 0$$

MATRIX[A] 3 ×3
[0   -1   1   ]
[2   1   1   ]
[4   -1   1   ]

MATRIX[B] 3 ×1
[-1   ]
[-5   ]
[-17   ]

[A]⁻¹[B]

                 [[-4]
                  [2]
                  [1]]

$$x^2 + y^2 - 4x + 2y + 1 = 0$$

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

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

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