10.1) Circles:

To graph a circle, you need to know:
1) center = \((h, k)\)
2) radius = \(r\)

\[(x - h)^2 + (y - k)^2 = r^2\]

In the example shown:
\[(x - 0)^2 + (y - 0)^2 = 9 \rightarrow (3)^2\]
\[x + y^2 = 9\]

\[(x - 5)^2 + (y - 1)^2 = (2)^2\]
\[(x - 5)^2 + (y - 1)^2 = 4\]
Another example:

\[ r = 5 \quad \text{center} \ (-2,-3) \]

\[(x-(-2))^2 + (y-(-3))^2 = 5^2 \]

\[(x+2)^2 + (y+3)^2 = 25 \]

Circular form \((x-h)^2 + (y-k)^2 = r^2\)

When you do not the circular form.

General form \(Ax^2 + By^2 + Cx + Dy + E = 0\)

\(x^2 + y^2 - 2x + 4y + 1 = 0\) Completing the square for both variables.

\[(x^2 - 2x) + (y^2 + 4y) = -1\]

\[\frac{1}{2}(-2) = -1 \Rightarrow (-1)^2 = 1 \quad \frac{4}{2} = 2 \Rightarrow (2)^2 = 4.\]

\[(x^2 - 2x + 1) + (y^2 + 4y + 4) = -1 + 1 + 4.
\[(x-1)^2 + (y+2)^2 = 4\]
10.2) Ellipses:

\[ \frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1 \]

- In 1, \( a \) is semi-major, \( b \) is semi-minor.
- In 2, \( a \) is semi-major, \( b \) is semi-minor.

Formula for Ellipses.

\[ \frac{(x-4)^2}{9} + \frac{(y-3)^2}{4} = 1 \]

\[ \frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1 \]

Example 2:

\[ \# 26 \] \( \frac{(x-1)^2}{9} + \frac{(y-3)^2}{4} = 1 \)

Draw the graph of the ellipse.

\( h = 1, \ k = 3 \Rightarrow (1,3) \)

\( a = 3, \ b = 2 \)
How to convert the General Equation to Elliptical Form.

Given \( AX^2 + BX^2 + CY + DY + E = 0 \),

change to \( \frac{(X-h)^2}{a^2} + \frac{(X-k)^2}{b^2} = 1 \)

Section 10-2)

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Ellipse: \( 4X^2 - 24X + Y^2 - 10Y + 25 = 0 \).

1) Grouping \( (4X^2 - 24X) + (Y^2 - 10Y) = -25 \) constant to the other side.

Complete square
\[
\begin{align*}
X & \rightarrow \frac{1}{2}(-6) = -3 \Rightarrow (-3)^2 = 9. \\
y & \rightarrow \frac{1}{2}(-10) = -5 \Rightarrow (-5)^2 = 25
\end{align*}
\]

Adding constants and balance on both sides.
\[
4(X^2 - 6X + 9) + (Y^2 - 10Y + 25) = -25 + 36
\]

\( +36 \) Because it is inside and 4 is multiplied by every thing inside the paran.

\[
4(X^2 - 6X + 9) + (Y^2 - 10Y + 25) = -25 + 36 + 25 = 36 \ , \ (3,11)
\]

4 \( (X-3)^2 + (Y-5)^2 = 36 \).

Divide by right side.
\[
\frac{4(X-3)^2}{36} + \frac{(Y-5)^2}{36} = 1
\]

Center is \( (3,5) \)

\( a = 3 \) \hspace{1cm} \( b = 6 \)
IN CLASSWORK

P 949

#48) Graph the Circle

\[(x+4)^2 + y^2 = 1\]

P 950

#37) Graph the Circle

\[x^2 + y^2 + 4x + 2y - 4 = 0\]

P 960

#26) Graph the Ellipse

\[\frac{(x-1)^2}{a} + \frac{(y-3)^2}{4} = 1\]