Radius: R
Center of circle: $(\ , b)$

640. Equation of a Circle Centered at the Origin (Standard Form)

$$x^2 + y^2 = R^2$$

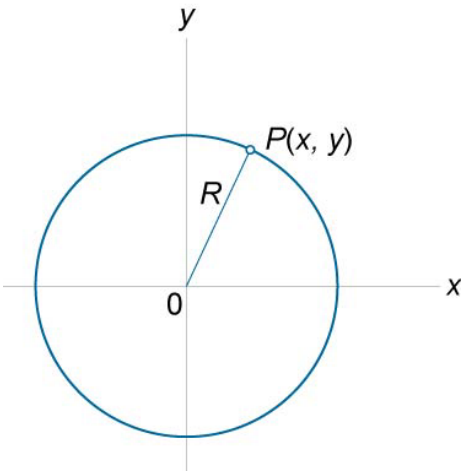

Figure 112.

641. Equation of a Circle Centered at Any Point (a, b)

$$(x - a)^2 + (y - b)^2 = R^2$$

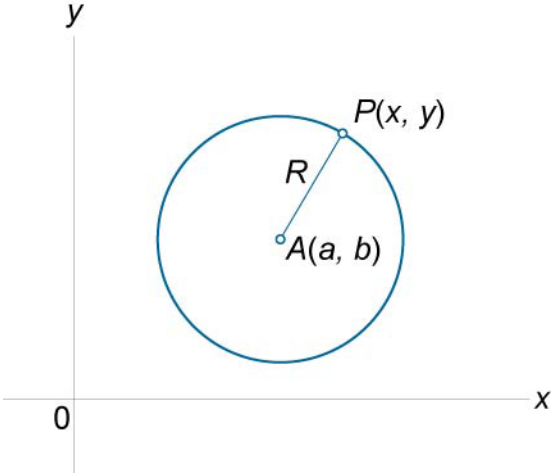

Figure 113.

642. Three Point Form

$$\begin{vmatrix} x^2+y^2 & x & y & 1 \\ x_1^2+y_1^2 & x_1 & y_1 & 1 \\ x_2^2+y_2^2 & x_2 & y_2 & 1 \\ x_3^2+y_3^2 & x_3 & y_3 & 1 \end{vmatrix} = 0$$

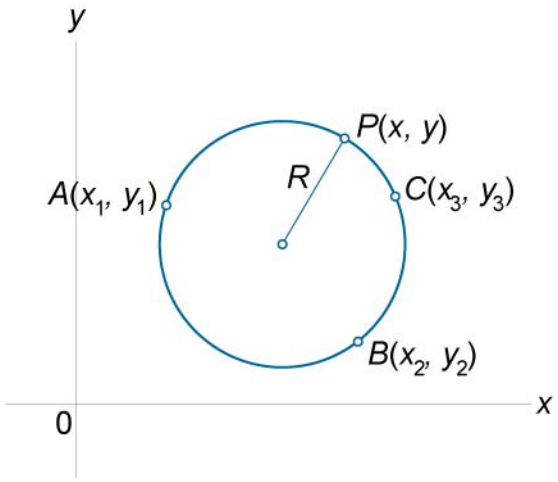

Figure 114.

643. Parametric Form

$$\begin{cases} x = R\cos t \\ y = R\sin t \end{cases}, \quad 0 \le t \le 2\pi .$$

644. General Form

$Ax^2 + Ay^2 + Dx + Ey + F = 0$ (A nonzero, $D^2 + E^2 > 4AF$).

The center of the circle has coordinates (a, b), where

$$a = -\frac{D}{2A}, \quad b = -\frac{E}{2A}.$$

The radius of the circle is

$$R = \sqrt{\frac{D^2 + E^2 - 4AF}{2|A|}}.$$