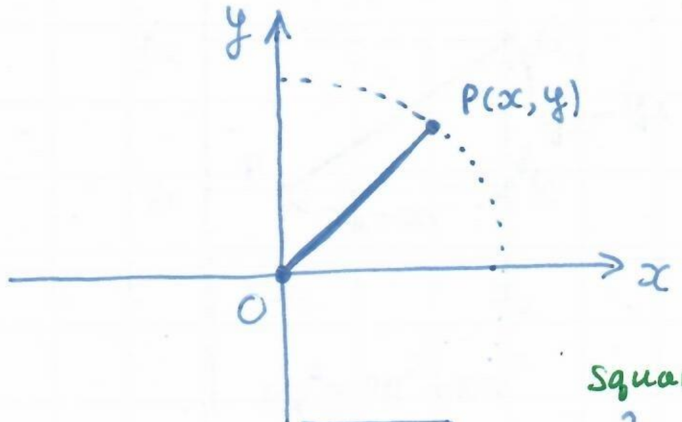
Fixing the Distance From $P(x, y)$ to the Origin.
↳ setting to not be changed

we get a circle.
of circle of radius
$r = OP$, centered
@ $(0,0)$



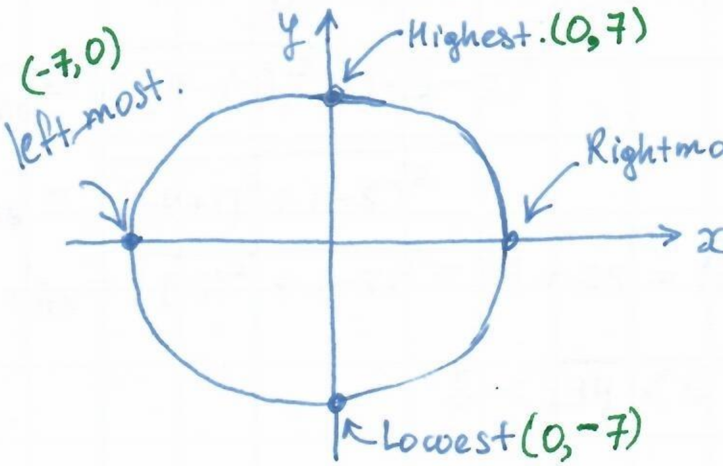
Squaring both sides:

$r = OP = d_{PO} = \sqrt{x^2+y^2} \Rightarrow r^2 = (\sqrt{x^2+y^2})^2$

$\boxed{x^2+y^2=r^2}$ ← Eq-n of a circle of radius r, centered @ $(0,0)$.

Example 1: What does $x^2+y^2=49$ represent?
Circle of radius 7, centered at $(0,0)$

Four Quick Points



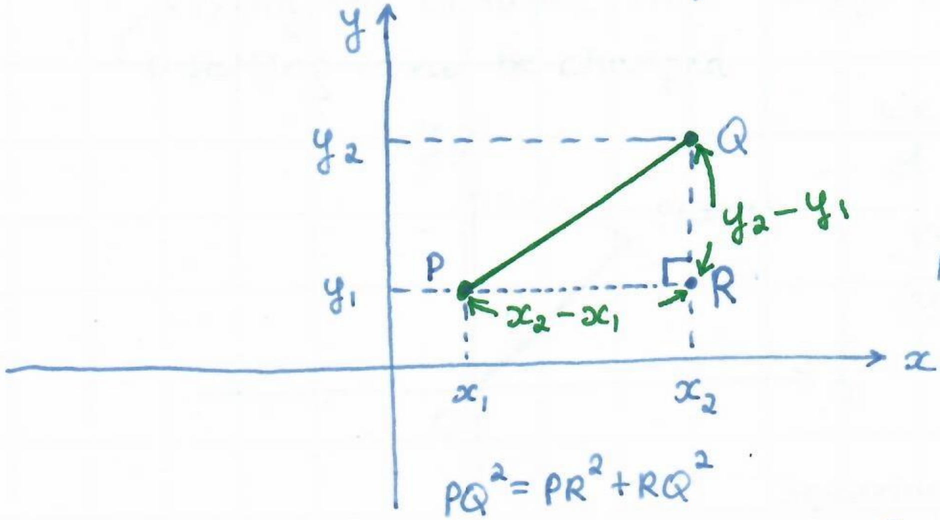
Other Points:
$(3, \sqrt{40}) = (3, 2\sqrt{10})$
$(-3, \sqrt{40}) = (-3, 2\sqrt{10})$
$(-3, -\sqrt{40}) = (-3, -2\sqrt{10})$
$(3, -2\sqrt{10})$

$(2, \sqrt{45}) = (2, 3\sqrt{5})$

Example 2: Determine an equation of a circle, centered at the origin so that $(-6, 7)$ is on the circle.

$x^2+y^2=r^2$ Sub $(-6,7)$
$(-6)^2+(7)^2=r^2$
$36+49=r^2$
$r^2=85$ → $x^2+y^2=85$ ✓

Distance Between Two Points on a Cartesian Plane:



$P(x_1, y_1)$

$Q(x_2, y_2)$

$\triangle PQR$ is a RAT

P.T. (Pythagorean Theorem)

$$PQ^2 = PR^2 + RQ^2$$

$$PQ^2 = d_{PQ}^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2, \quad d_{PQ} \geq 0$$

$$\boxed{d_{PQ} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}}$$ Distance Formula.

Example: Determine the distance from $\underset{1}{A}(-1, 2)$ to $\underset{2}{B}(-4, -3)$

$$d_{AB} = \sqrt{(-4-(-1))^2 + (-3-2)^2}$$

$$d_{AB} = \sqrt{(-4+1)^2 + (-5)^2}$$

$$d_{AB} = \sqrt{(-3)^2 + (-5)^2} = \sqrt{9 + 25} = \sqrt{34}$$

$$5 < \sqrt{34} < 6$$