Day 25

10.3 More Circles

Graph on the calculator

① $x^2 + y^2 = 25$

$-x^2 \quad -x^2$

$\sqrt{y^2} = \sqrt{-x^2+25}$

$y = \pm\sqrt{-x^2+25}$

p. 567 program calculator

also a conics app

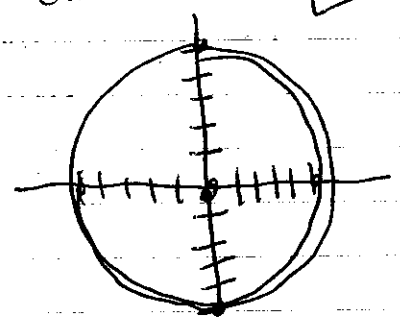
$Y_1 = \sqrt{(-x^2+25)}$ TOP circle

$Y_2 = -\sqrt{(-x^2+25)}$ Bottom circle

zoom fit

D: [-5, 5]

R: [-5, 5]



② Writing the equation of a circle when given the center and a point on the circle.

case 1: center (0,0)

use the pyt. thm.

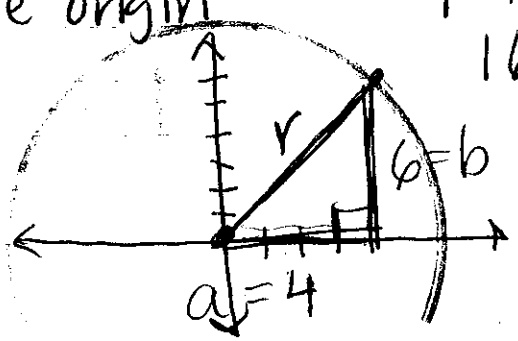
$a^2 + b^2 = c^2$

$4^2 + 6^2 = r^2$

$16 + 36 = r^2$

$52 = r^2$

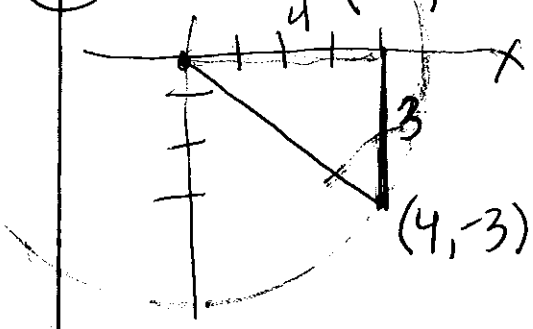
(ex) WTEOTC with the center at the origin thru (4,6).



$x^2 + y^2 = r^2$

$x^2 + y^2 = 52$

(ex) thru (4,-3) center is at origin



$3^2+4^2=r^2$

$9+16=r^2$

$25=r^2$

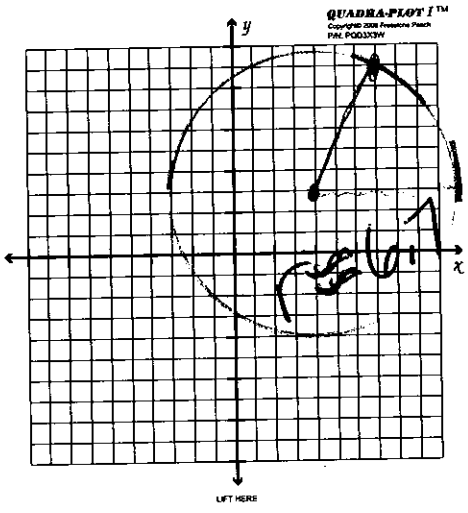
$$x^2+y^2=25$$

case 2: center is at (h,k)

use the distance formula.

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

(ex) WTEOTC with a center $(\overset{x_1}{4},\overset{y_1}{3})$ and a point at $(\underset{x_2}{7},\underset{y_2}{9})$



$d=\sqrt{(7-4)^2+(9-3)^2}$

$d=\sqrt{3^2+6^2}$

$d=\sqrt{9+36}$

$d=\sqrt{45}$ radius $=\sqrt{45}$

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

$(x-4)^2+(y-3)^2=(\sqrt{45})^2$

$$(x-4)^2+(y-3)^2=45$$

(ex) center $(-3,5)$ point $(2,-1)$

$x_1\ y_1$ $\quad$ $x_2\ y_2$

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

$$d = \sqrt{(-6)^2 + 5^2}$$

$$d = \sqrt{36+25} \qquad d = \sqrt{61}$$

$$(x+3)^2 + (y-5)^2 = (\sqrt{61})^2$$

$$\boxed{(x+3)^2 + (y-5)^2 = 61}$$

$$\boxed{r = \sqrt{61} \approx 7.8}$$

(3) Writing the equation in standard form by completing the square.

(ex) $x^2 + y^2 + 10x - 6y + 18 = 0$

$-18 \qquad -18$

$\left(\frac{1}{2}b\right)^2$

$$x^2 + 10x + \boxed{25} + y^2 - 6y + \boxed{9} = -18 + \boxed{25} + \boxed{9}$$

$\left(\frac{1}{2}\cdot 10\right)^2 = [\blacksquare]^2$ $\qquad$ $\left(\frac{1}{2}\cdot -6\right)^2 = [\blacksquare]^2$

Factor

$$(x+5)(x+5) + (y-3)(y-3)$$

$$\boxed{(x[\blacksquare])^2 + (y[\blacksquare])^2 = 16}$$

$\sqrt{16}$

$$\boxed{\text{center } (-5,3) \quad r = 4}$$

(ex) $x^2+y^2-12x+18y-4=0$ (always positive)

$+4 \quad +4$

$x^2-12x+\boxed{36}+y^2+18y+\boxed{81}=4+\boxed{36}+\boxed{81}$

$(x-6)^2+(y+9)^2=121$

$(\frac{1}{2},-12)$ ± 6 $\pm\frac{1}{2}b$

center $(6,-9)$

$r=11$

10.3

~~11.2~~ Circles Name_ p. 565 (48-50)

For Problems (1-8): Write the equation of the circle in standard form. Identify the radius and center. Sketch the graph.

(1-7)

1.) $x^2 + y^2 - 12x + 18y - 4 = 0$ _____ _____

2.) $x^2 + y^2 + 6x - 4y + 4 = 0$ _____

3.) $x^2 + y^2 - 2x + 6y - 6 = 0$ _____

4.) $x^2 + y^2 - 8x - 20y + 115 = 0$ _____

5.) $x^2 + y^2 - 6x - 8y + 21 = 0$ _____

6.) $x^2 + y^2 + 10x - 6y + 33 = 0$ _____

7.) $x^2 + y^2 - 4x - 6y + 4 = 0$ _____

~~8.)~~ ✓ $4x^2 + 4y^2 - 20x - 16y + 37 = 0$ _____

Find the equation for the conic.

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

h k

9.) Center: (9, 3) Radius: 4

_____

10.) Center: (-3, 1) Radius: 9

_____

11.) Center: (-4, -6) Radius: 7

_____

12.) Center: (5, -7) Radius: 12

_____

In 13–16, write the standard form of the equation of the circle with the given radius and whose center is the origin. $x^2+y^2=r^2$

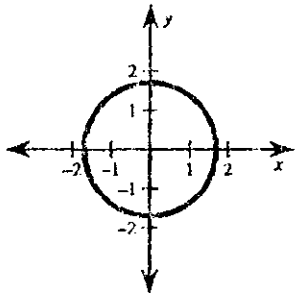
13. $2=r$ 14. $\sqrt{6}$ 15. $\frac{1}{3}$ 16. $\frac{\sqrt{5}}{5}$

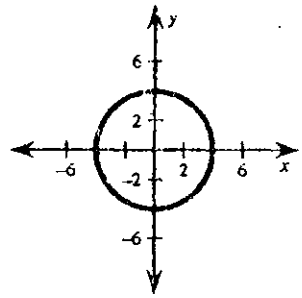
In 17–20, write the standard form of the equation of the circle that passes through the given point and whose center is the origin. Pyt. Thm $x^2+y^2=r^2$

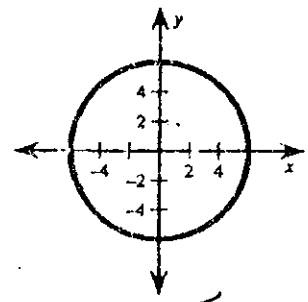
17. (4, 6) 18. (−5, 0) 19. (−2, 4) 20. (5, −2)

In 21–23, match the equation with its graph.

21. $x^2 + y^2 = 16$ 22. $x^2 + y^2 = 36$ 23. $x^2 + y^2 = 3$

a. 

b. 

c. 

$x^2+(x+1)^2=25$
$x^2+(x+1)(x+1)=25$

In 24–27, find the points of intersection, if any, of the graphs.

24. $x^2 + y^2 = 45$, $y = 2x$ 25. $x^2 + y^2 = 25$, $y = x + 1$ 26. $x^2 + y^2 = 36$, $x + y = 12$ 27. $x^2 + y^2 = 3$, $2y = x^2$

graph or do substitution

$x^2+(2x)^2=45$
$x^2+(2x)(2x)=45$
$1x^2+4x^2=45$
$\frac{5x^2}{5}=\frac{45}{5}$
$\sqrt{x^2}=\sqrt{9}$ $x=\pm 3$

$y=2(3)=6$
$y=2(-3)=-6$

(3, 6)
(−3, −6)

28. ***Three Rivers Stadium*** Three Rivers Stadium is the home of the Pittsburgh Pirates. The stadium is approximately circular with a diameter of 800 feet. Suppose a coordinate plane were superimposed over the base of the stadium with the origin at the center of the stadium. Write an equation (in standard form) for the outside boundary of the stadium.