Name Hansen Hour 4 Date 1/29/2020

Algebra 2: Equation of a CIRCLE, via "completing the square"

Equation of a Circle: $(x - h)^2 + (y - k)^2 = r^2$

Where **(h, k) is the center** and **r is the radius.**

Warm-up

Use the information provided to write the standard form equation of each circle.

1) Center: $(-5, 2)$
Radius: 8

$(x+5)^2+(y-2)^2=64$

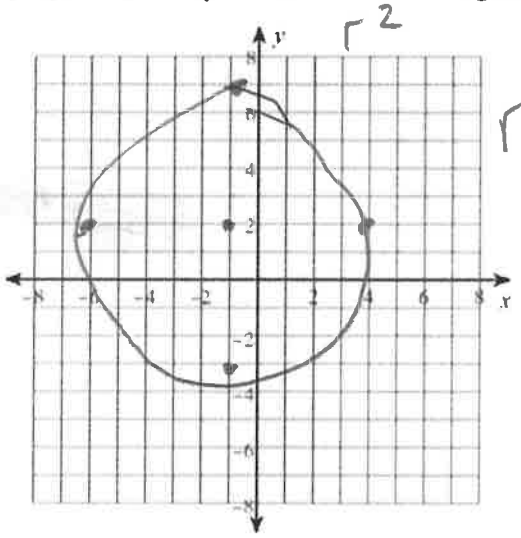
2) Center: $(12, 10)$
Radius: 2

$(x-12)^2+(y-10)^2=4$

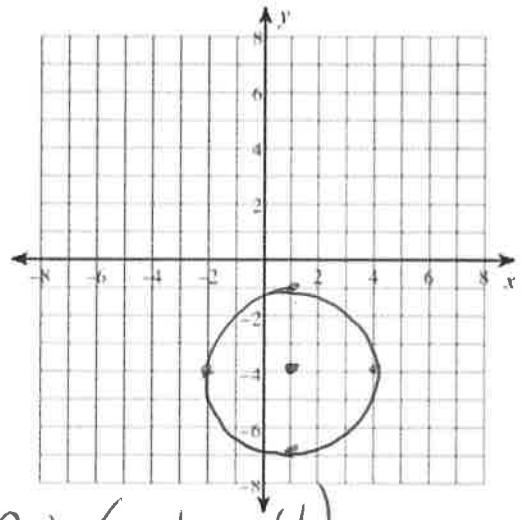
Identify the center and radius of each. Then sketch the graph.

3) $(x + 1)^2 + (y - 2)^2 = 25$ C: $(-1, 2)$ r^2

$r=\sqrt{25}=5$



4) $(x - 1)^2 + (y + 4)^2 = 9$



C: $(1, -4)$

r: 3

So: We know how to identify the center and a radius of a circle when given the following format:

CIRCLE: $(x - 3)^2 + (y + 2)^2 = 25$ C (3, -2) r = 5 ✓

However, sometimes the equation isn't in this standard form!

For Example: $x^2 + y^2 - 4x + 6y - 12 = 0$ IS the equation of a circle! BUT, it *seems* impossible to tell what's the center (h, k) and the radius, r, in this particular format. Take a guess…. I dare ya!

So, we have to manipulate this equation to make it look like the standard: $(x - h)^2 + (y - k)^2 = r^2$

This process of making the equation look like standard form is called **"Completing the Square."**

Example One: $x^2 + y^2 - 4x + 6y - 12 = 0$ (+12 +12)

(1) Re-orgnize $(x^2 - 4x + \boxed{4}) + (y^2 + 6y + \boxed{9}) = 12 + \boxed{4} + \boxed{9}$ (Constant = #)

(2) Get # in Box
Take half coeffient,
Then Square it.

(3) make a binomial square

Half, Square it

Cut in Half

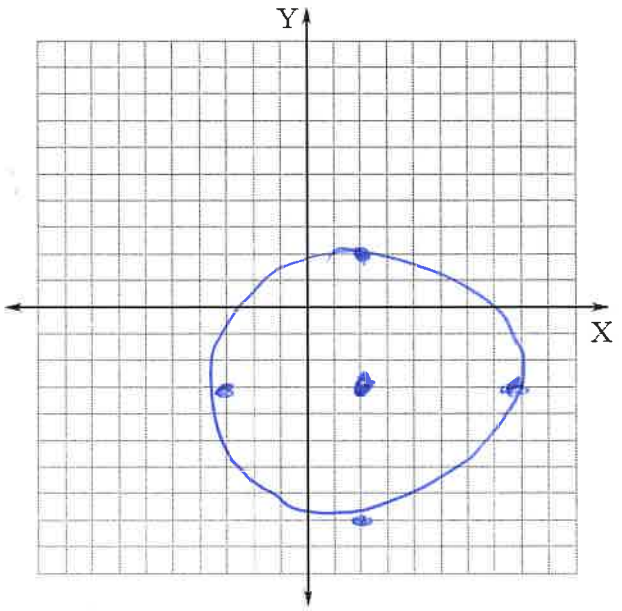
Cut Half

TOTAL

$(x - 2)^2 + (y + 3)^2 = 25$

C: (2, -3)

r: $\sqrt{25} = 5$



Example Two: $x^2 + y^2 + 8x + 2y + 8 = 0$

$-8 \quad -8$

$(x^2 + 8x + \boxed{16}) + (y^2 + 2y + \triangle 1) = -8 + \boxed{16} + \triangle 1$

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$(x+4)^2 + (y+1)^2 = 9$

Example Three: $x^2 + y^2 + 6x - 8y + 24 = 0$

$(x^2 + 6x + \boxed{9}) + (y^2 - 8y + \triangle 16) = -24 + \boxed{9} + \triangle 16$

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

Example Four: $x^2 + y^2 + 2y - 24 = 0$

$x^2 + (y^2 + 2y + \triangle 1) = 24 + \triangle 1$

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