Circles

Center-Radius Form		
Center	Radius	Equation of the Circle
(h, k)	r	$(x-h)^2+(y-k)^2=r^2$
(0, 0)	r	$x^2+y^2=r^2$

I. **Find the center-radius form** of each circle with the given center and radius.

Center (-1, 4), radius 3 $\qquad (x+1)^2+(y-4)^2=3^2$

II. **Find the center and radius** of the given circle.

$(x+2)^2+y^2=25$ $\qquad$ Center (-2, 0), radius 5

General Form
$x^2+y^2+cx+dy+e=0$
For some real numbers *c, d,* and *e*, this can have a graph that is a circle, a point, or be nonexistent.

III. **Rewrite center-radius form into general form,** by expanding the binomials and making the right side 0. Be sure the terms are in general form order.

$(x-3)^2+(y+2)^2=16$

$(x-3)\,(x-3)+(y+2)\,(y+2)-16=0$

$x^2-3x-3x+9+y^2+2y+2y+4-16=0$

$x^2-6x+9+y^2+4y+4-16=0$

$x^2+y^2-6x+4y+9+4-16=0$

$x^2+y^2-6x+4y-3=0$

M-C3 IV. **Rewrite general form into center-radius form,** by completing the square for x and y. Be sure the terms are in center-radius form order.

$x^2 + y^2 + 8x - 12y + 43 = 0$

$x^2 + 8x + y^2 - 12y = -43$

$x^2 + 8x +$ ______ $+ y^2 - 12y +$ ______ = -43 + ______ + ______

$x^2 + 8x + \left(\frac{8}{2}\right)^2 + y^2 - 12y + \left(\frac{-12}{2}\right)^2 = -43 + \left(\frac{8}{2}\right)^2 + \left(\frac{-12}{2}\right)^2$

$x^2 + 8x + (4)^2 + y^2 - 12y + (-6)^2 = -43 + (4)^2 + (-6)^2$

$(x^2 + 8x + 16) + (y^2 - 12y + 36) = -43 + 16 + 36$

$(x + 4)^2 + (y - 6)^2 = 9$

V. **Determining whether a graph is a circle, point, or nonexistent.** First find the center-radius form of the equation, then:

a) If the radius, ***r***, is positive, it is a circle
b) If the radius, ***r***, is zero, it is a point
c) If the radius, ***r***, is negative, it is nonexistent.

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M-C3