① (2, 9)

$(x-2)^2+(y-9)^2$

$x^2+y^2=85$

② $x^2+y^2=41$

③ $(x-2)^2+(y+4)^2=625$

④ $(x+1)^2+y^2=54$

Remember Completing the Square

How to complete the square

1. Leading coefficient MUST be 1.
2. Move all constants to 'other' side.
3. Find [redacted]^2 and ADD to both sides.
4. Factor your new Perfect Square.... ☺

Let's Try

(Ex 1) Solve by Completing the Square	(Ex 2) Solve by Completing the Square
$x^2 + 6x - 8 = 0$	$x^2 - 2x - 10 = 0$
$x^2+6x = 8$ $\left(\frac{6}{2}\right)^2 = 9$ $x^2+6x+9 = 8+9$ $(x+3)^2 = 17$	$+1 \quad +10$ $x^2-2x = 10$ $\left(\frac{-2}{2}\right)^2$ $x^2-2x+1 = 10+1$ $(x-1)^2 = 11$
(Ex 3) Solve by Completing the Square	(Ex 4) Solve by Completing the Square
$4y^2 - 16y + 12 = 0$ $\frac{4}{4} \quad \frac{16}{4} \quad \frac{12}{4} \quad \frac{0}{4}$ $y^2 - 4y + 3 = 0$ $-3 \quad -3$ $\left(\frac{-4}{2}\right)^2$ $y^2 - 4y + 4 = -3 + 4$ $(y-2)^2 = 1$	$2x^2 + 12x - 18 = 0$ $(x+3)^2 = 18$

Converting Circles: General to Standard

(Ex 1) Put equation in standard form
Write the equation of the circle in standard form (complete the square):
$x^2 + 6x + y^2 + 8y - 11 = 0$

$x^2+6x+\underline{9}+y^2+8y+\underline{16}=11+\underline{9}+\underline{16}$

$\left(\frac{6}{2}\right)^2=9$ $\left(\frac{8}{2}\right)^2=16$

$(x+3)^2+(y+4)^2=36$

(Ex 2) Put equation in standard form
Write the equation of the circle in standard form (complete the square):
$x^2 + 8x + y^2 - 10y = 7$

$x^2+8x+\underline{16}+y^2-10y+\underline{25}=7+\underline{16}+\underline{25}$

$\left(\frac{8}{2}\right)^2$ $\left(\frac{-10}{2}\right)^2=25$

$(x+4)^2+(y-5)^2=48$

(Ex 3) Put equation in standard form
Write the equation of the circle in standard form (complete the square):
$x^2 + y^2 + 3y = 15$

$x^2+y^2+3y+\underline{2.25}=15+\underline{2.25}$

$\left(\frac{3}{2}\right)^2$

$x^2+(y+1.5)^2=17.25$

(Ex 4) Put equation in standard form
Write the equation of the circle in standard form (complete the square):
$x^2 + 6x + y^2 = 12$

$(x+3)^2+y^2=21$

Checkpoint
Write the equation of the circle in standard form (complete the square):

$x^2 - 2x + y^2 + 4y + 5 = 9$
$-5 \quad -5$

$x^2-2x+\underline{1}+y^2+4y+\underline{4}=4+\underline{1}+\underline{4}$

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

Converting Circles: Standard to General

(Ex 1) Put equation in general form
Write the equation of the circle in general form (multiply):
$(x+2)^2 + (y+5)^2 = 0$

$(x+2)(x+2) + (y+5)(y+5) = 0$

$x^2+2x+2x+4+y^2+5y+5y+25=0$

$x^2+4x+y^2+10y+29=0$

(Ex 2) Put equation in general form
Write the equation of the circle in general form (multiply):
$(x-4)^2 + (y+9)^2 = 0$

$(x-4)(x-4) + (y+9)(y+9) = 0$

$x^2-4x-4x+16+y^2+9y+9y+81=0$

$x^2-8x+y^2+18y+97=0$