MORE PRACTICE: Completing the Square

What number is necessary to make the equation a "perfect square"?

1. $x^2 + 8x +$ 16 $\quad 8/2 = 4 \quad 4^2 = 16$

2. $x^2 - 14x +$ 49 $\quad 14/2 = 7 \quad 7^2 = 49$

3. $x^2 + 15x +$ $\frac{225}{4}$ $\quad \frac{15}{2} \div \frac{15}{2} \quad \left(\frac{15}{2}\right)^2 = \frac{225}{4}$

4. $x^2 - \frac{1}{2}x +$ 1/16 $\quad \frac{1}{2}/2 = \frac{1}{4} \quad \left(\frac{1}{4}\right)^2 = \frac{1}{16}$

Complete the squares to write the conic sections in their standard form.

5. $x^2 - 16x + y^2 + 6y + 48 = 0$

$(x^2 - 16x \quad) + (y^2 + 6y \quad) = -48 \longrightarrow (x-8)^2 + (y+3)^2 = 121$

$(x^2 - 16x + 64) + (y^2 + 6y + 9) = -48 + 64 + 9$

6. $x^2 + 6x + y^2 - 8y + 9 = 0$

$(x^2 + 6x \quad) + (y^2 - 8y \quad) = -9 \longrightarrow (x+3)^2 + (y-4)^2 = 16$

$(x^2 + 6x + 9) + (y^2 - 8y + 16) = -9 + 9 + 16$

7. $x^2 + 10x - 4y + 1 = 0$

$4y = (x^2 + 10x \quad) + 1 \qquad 4y = (x+5)^2 - 24 \rightarrow y = \frac{1}{4}(x+5)^2 - 6$

$4y = (x^2 + 10x + 25) + 1 - 25$

8. $25x^2 - 150x - 16y^2 + 64y - 239 = 0$

$25(x^2 - 6x \quad) - 16(y^2 - 4y \quad) = 239$

$25(x^2 - 6x + 9) - 16(y^2 - 4y + 4) = 239 + 25(9) - 16(4)$

$\frac{25(x-3)^2}{400} - \frac{16(y-2)^2}{400} = \frac{400}{400} \longrightarrow \frac{(x-3)^2}{16} - \frac{(y-2)^2}{25} = 1$

9. $9x^2 + 18x + 4y^2 + 16y - 119 = 0$

$9(x^2 + 2x \quad) + 4(y^2 + 4y \quad) = 119 \longrightarrow \frac{(x+1)^2}{16} + \frac{(y+2)^2}{36} = 1$

$9(x^2 + 2x + 1) + 4(y^2 + 4y + 4) = 119 + 9(1) + 4(4)$

$\frac{9(x+1)^2}{144} + \frac{4(y+2)^2}{144} = \frac{144}{144}$

10. Graph the conic section: $4x^2 + 24x - y^2 - 2y + 19 = 0$

$4(x^2 + 6x \quad) - (y^2 + 2y \quad) = -19$

$4(x^2 + 6x + 9) - (y^2 + 2y + 1) = -19 + 4(9) - 1(1)$

$\frac{4(x+3)^2}{16} - \frac{(y+1)^2}{16} = \frac{16}{16}$

$\frac{(x+3)^2}{4} - \frac{(y+1)^2}{16} = 1 \qquad (h,k) = (-3,-1)$

$a = 2$

$b = 4$