GSE Algebra 1 **8.6 – Complete the square notes** Name: _____

Factor the following.

$8x^2 + 34x - 9$

$-72$, $36 - 2$

| | $2x$ | $9$ |
|---|---|---|
| $4x$ | $8x^2$ | $36x$ |
| $-1$ | $-2x$ | $-9$ |

$(4x-1)(2x+9)$

$\frac{3x^2 - 300}{3} \quad \frac{}{3}$

$3(x^2 - 100)$

$x \cdot x \quad 10 \cdot -10$

$3(x-10)(x+10)$

$4x^2 - 169 = 0$

$2x \cdot 2x \quad 13 \cdot -13$

$(2x+13)(2x-13) = 0$

$2x+13=0 \quad 2x-13=0$

$x = 13/2$

$x = -13/2$

Complete the square to solve for x.

1) $x^2 + 20x - 36 = 0$

$+36 \quad +36$

$x^2 + 20x + (10)^2 = 36 + 100$

$x \cdot x \quad \frac{20}{2} \quad 10 \cdot 10$

$(10)^2 = 100$

$(x+10)(x+10) = 136$

$\sqrt{(x+10)^2} = \sqrt{136}$

$x + 10 = \pm 2\sqrt{34}$

$-10 \quad -10$

$x = -10 \pm 2\sqrt{34}$

2) $x^2 - 20x + 6 = 0$

$-6 \quad -6$

$x^2 - 20x + (-10)^2 = -6 + 100$

$\frac{-20}{2}$

$(-10)^2 = 100$

$(x-10)(x-10) = 94$

$\sqrt{(x-10)^2} = \sqrt{94}$

$x - 10 = \pm\sqrt{94}$

$+10 \quad +10$

$x = 10 \pm \sqrt{94}$

3) $x^2 + 6x = -5$

$x^2 + 6x + \frac{(3)^2}{2} = -5 + 9$

$(3)^2 = 9$

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

$x + 3 = \pm 2$

$-3 \quad -3$

$x = -3 \pm 2$

$-3+2 \quad -3-2$

$-1 \quad -5$

**Now let's complete the square when $a \neq 1$.**

4) $3x^2 - 6x - 2 = 0$

$3x^2 - 6x = 2$

$\frac{3x^2}{3} - \frac{6x}{3} = \frac{2}{3}$

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

$(-1)^2 = 1$

$3(x-1)(x-1) = 5$

$3(x-1)^2 = 5$

$\frac{3(x-1)^2}{3} = \frac{5}{3}$

$\sqrt{(x-1)^2} = \sqrt{\frac{5}{3}}$

$x - 1 = \pm\sqrt{\frac{5}{3}}$

$x = 1 \pm \sqrt{\frac{5}{3}}$

5) $4x^2 + 12x - 1 = 0$

$4x^2 + 12x = 1$

$\frac{4x^2}{4} + \frac{12x}{4} = \frac{1}{4}$

$4(x^2 + 3x + \frac{(1.5)^2}{2}) = 1 + 4(2.25)$

$(1.5)^2 = 2.25$

$4(x+1.5)(x+1.5) = 10$

$4(x+1.5)^2 = 10$

$\frac{4(x+1.5)^2}{4} = \frac{10}{4}$

$\sqrt{(x+1.5)^2} = \sqrt{2.5}$

$x + 1.5 = \pm\sqrt{2.5}$

$x = -1.5 \pm \sqrt{2.5}$

6) $2x^2 - 20x - 62 = 0$

$2x^2 - 20x = 62$

$\frac{2x^2}{2} - \frac{20x}{2} = \frac{62}{2}$

$2(x^2 - 10x + \frac{(-5)^2}{2}) = 62 + 2(25)$

$(-5)^2 = 25$

$\frac{2(x-5)^2}{2} = \frac{112}{2}$

$\sqrt{(x-5)^2} = \sqrt{56}$

$x - 5 = \pm 2\sqrt{14}$

$x = 5 \pm 2\sqrt{14}$

7) $5x^2 - 10x - 21 = 0$

$5x^2 - 10x = 21$

$\frac{5x^2}{5} - \frac{10x}{5} = \frac{21}{5}$

$5(x^2 - 2x + \frac{(-1)^2}{2}) = 21 + 5(1)$

$(-1)^2 = 1$

$\frac{5(x-1)^2}{5} = \frac{26}{5}$

$\sqrt{(x-1)^2} = \sqrt{\frac{26}{5}}$

$x - 1 = \pm\sqrt{\frac{26}{5}}$

$x = 1 \pm \sqrt{\frac{26}{5}}$

8) $7x^2 - 14x = 56$

$\frac{7x^2}{7} - \frac{14x}{7} = \frac{56}{7}$

$7(x^2 - 2x + \frac{(-1)^2}{2}) = 56 + 7(1)$

$(-1)^2 = 1$

$7(x-1)(x-1) = 63$

$\frac{7(x-1)^2}{7} = \frac{63}{7}$

$\sqrt{(x-1)^2} = \sqrt{9}$

$x - 1 = \pm 3$

$1 \pm 3$

9, $-2$

9) $3x^2 - 9x - 1 = 0$

$3x^2 - 9x = 1$

$\frac{3x^2}{3} - \frac{9x}{3} = \frac{1}{3}$

$3(x^2 - 3x + \frac{(-1.5)^2}{2}) = 1 + 3(2.25)$

$(-1.5)^2 = 2.25$

$\frac{3(x-1.5)^2}{3} = \frac{7.75}{3}$

$\sqrt{(x-1.5)^2} = \sqrt{\frac{31}{12}}$

$x - 1.5 = \pm\sqrt{\frac{31}{12}}$

$x = 1.5 \pm \sqrt{\frac{31}{12}}$