Algebra I
12-2
Completing the Square

<u>Completing the Square</u> - A way to transform an equation so that part of it will backwards FOIL.

Solve.

*1) $x^2 - 2x - 5 = 0$

$(x + \quad)(x - \quad)$

Prime

Doesn't work

$\left\{ \begin{array}{l} \\ \\ \\ \end{array} \right.$

$x^2 - 2x = 5$

$x(x - 2) = 5$

Not $= 0$
Doesn't Work

$\left\{ \begin{array}{l} \\ \\ \\ \end{array} \right.$

$x^2 - 2x - 5 = 0$

$a = 1 \quad b = -2 \quad c = -5$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \dfrac{-(-2) \pm \sqrt{4 - 4(1)(-5)}}{2(1)}$

$x = \dfrac{2 \pm \sqrt{4 + 20}}{2} = \dfrac{2 \pm \sqrt{24}}{2} = \dfrac{2 \pm 2\sqrt{6}}{2}$

$\{1 \pm \sqrt{6}\}$

Solve. | Completing the Square

*1) $x^2 - 2x - 5 = 0$ | $ax^2 + bx + c = 0$

$(x^2 - 2x \quad) - 5 \quad = 0$ | 1) Isolate c.

$\uparrow$ it is one! | 2) Get $a = 1$.

$(x^2 - 2x +1 \quad) - 5 - 1 = 0$ | 3) Take b, half it, square it,
$b = -2; \; b = -1; \; = (-1)^2 = 1$ | halve

 | and apply to equation.

$(x - 1)(x - 1) - 6 = 0$ | 4) Solve. $\sqrt{(x-1)^2} = \sqrt{6}$
$(x-1)^2 - 6 = 0$ | $|x - 1| = \sqrt{6}$
$+6 \quad +6$ | $x - 1 = \pm\sqrt{6} \cdot x = 1 \pm \sqrt{6}$
 | $+1 \quad +1$

Oral Exercises

Complete the square.

*2) $x^2 - 14x + \underline{49} = (x - 7)^2$

$-14 \rightarrow \boxed{-7} \rightarrow 49$

*3) $x^2 - 3x + \underline{\frac{9}{4}} = (x - \frac{3}{2})^2$

$-3 \rightarrow \boxed{-\frac{3}{2}} \rightarrow +\frac{9}{4}$

Written Exercises

Solve by completing the square.

*4) $2t^2 + 4t = -1$

$$2t^2 + 4t + 1 = 0$$

$$(2t^2 + 4t \quad) + 1 = 0$$

$$2(t^2 + 2t + 1) + 1 - 2 = 0$$

$$b = 2 \rightarrow \boxed{1} \rightarrow 1^2 = 1$$

$$2(t+1)^2 - 1 = 0$$

$$\frac{2(t+1)^2}{2} = \frac{1}{2}$$

$$\sqrt{(t+1)^2} = \sqrt{\frac{1}{2}}$$

$$|t+1| = \frac{\sqrt{1}\sqrt{2}}{\sqrt{2}\sqrt{2}}$$

$$t+1 = \pm \frac{\sqrt{2}}{2}$$

$$t = \left\{ -1 \pm \frac{\sqrt{2}}{2} \right\}$$

Assignment:
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    Oral Exercises: 1-6 all
    Written Exercises: 1-9 all