Date: ________________

Lesson 12: Factoring Special Polynomials

Perfect Square Trinomials

A ***perfect square trinomial*** is formed from the product of two identical binomials. When you recognize a quadratic trinomial as a PST, it makes factoring it quite easy, since there is an inherent pattern.

Recall: $(x+3)^2$ $(x-3)^2$

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

x^2+6x+9 x^2-6x+9

In order to be a PST: The first and last terms must be perfect squares, and the middle term must be twice the product of the square roots of the first and last terms.

The pattern when squaring a binomial: $(a+b)^2 =$ $a^2+2ab+b^2$

$(a-b)^2 =$ $a^2-2ab+b^2$

- The first term in the trinomial is the square of the first term in the binomial.
- The last term in the trinomial is the square of the last term in the binomial.
- The middle term in the trinomial is twice the product of the first and last terms in the binomial.

We can use this pattern to work backwards and factor a perfect square trinomial.

$\boldsymbol{a^2+2ab+b^2=(a+b)^2}$ **or** $\boldsymbol{a^2-2ab+b^2=(a-b)^2}$

Examples:

1) $a^2+12a+36$

$(a+6)^2$

$\sqrt{a^2}=a$

$\sqrt{36}=6$

$2(1)(6)=12$

2) $4x^2 + 12x + 9$

$(2x+3)^2$

$\sqrt{4x^2} = 2x$

$\sqrt{9} = 3$

$2(2)(3) = 12$

3) $25x^2 - 20x + 4$

$(5x-2)^2$

$\sqrt{25x^2} = 5x$

$\sqrt{4} = 2$

$(2)(5)(2) = 20$

*If we can identify perfect square trinomials, then we don't have to use decomposition to factor them (sometimes the numbers are very large!)

4) $9g^2 + 48g + 64$

$(3g+8)^2$

$\sqrt{9g^2} = 3g$

$\sqrt{64} = 8$

$2(3)(8) = 48$

Determine if the following are P.S.T.'s:

1) $y^2 + 8y - 16$

no!

2) $4x^2 - 36x + 81$

$\sqrt{81}$ $\sqrt{4}$

$2(9)(2) = 36$

$(2x-9)^2$

Factor the following:

1) $a^2 + 14a + 49$

$(a+7)^2$

2) $49r^2 - 28r + 4$

$(7r-2)^2$

3) $25n^2 + 30n + 9$

$(5n+3)^2$

4) $9a^2 - 42a + 49$

$(3a-7)^2$

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