Polynomials and Special Products:

Sum and difference of same terms: $(u+v)(u-v) = u^2 - v^2$

Example: $(x+2)(x-2) = x^2 + 2x - 2x - 2^2 = x^2 - 2^2 = x^2 - 4$

Square of a Binomial: 1) $(u+v)^2 = (u+v)(u+v) = u^2 + 2uv + v^2$

And: **2)** $(u-v)^2 = (u-v)(u-v) = u^2 - 2uv + v^2$

Notice the middle term is always: 2 * first * second

Using method **1) example:** $(x+2)^2 = (x+2)(x+2) = x^2 + 2(x)(2) + 2^2 = x^2 + 4x + 4$

Using method **2) example:** $(x-2)^2 = (x-2)(x-2) = x^2 - 2(x)(2) + 2^2 = x^2 - 4x + 4$

Cube of a Binomial: 1) $(\boldsymbol{u+v})^{\boldsymbol{3}} = \boldsymbol{u^3 + 3u^2v + 3uv^2 + v^3}$

And: **2)** $(\boldsymbol{u-v})^{\boldsymbol{3}} = \boldsymbol{u^3 - 3u^2v + 3uv^2 - v^3}$

Using method **1) example:**

$(x+2)^3 = (x+2)(x+2)(x+2) = x^3 + 3x^2(2) + 3x(2^2) + 2^3 = x^3 + 6x^2 + 12x + 8$

Using method **2) example:**

$(x-2)^3 = (x-2)(x-2)(x-2) = x^3 - 3x^2(2) + 3x(2^2) - 2^3 = x^3 - 6x^2 + 12x - 8$

Factoring of Special Polynomials:

Factored Form	Example
Difference of two squares $\boldsymbol{u^2 - v^2 = (u+v)(u-v)}$	$16x^2 - 4 = (4x)^2 - 2^2 = (4x+2)(4x-2)$
Perfect Square Trinomial **1)** $\boldsymbol{u^2 + 2uv + v^2 = (u+v)^2}$ **2)** $\boldsymbol{u^2 - 2uv + v^2 = (u-v)^2}$	**1)** $x^2 + 8x + 16 = x^2 + 2(x)(4) + 4^2 = (x+4)^2$ **2)** $x^2 - 8x + 16 = x^2 - 2(x)(4) + 4^2 = (x-4)^2$
Sum or Difference of Two Cubes **1)** $\boldsymbol{u^3 + v^3 = (u+v)(u^2 - uv + v^2)}$ **2)** $\boldsymbol{u^3 - v^3 = (u-v)(u^2 + uv + v^2)}$	**1)** $x^3 + 27 = x^3 + 3^3 = (x+3)(x^2 - 3x + 9)$ **2)** $x^3 - 27 = x^3 - 3^3 = (x-3)(x^2 + 3x + 9)$

Trevor L.A.