Algebra 2 CC Name ______________________________
Identities

1.) Erin and Christa were working on cubing binomials for math homework. Erin believed they could save time with a shortcut. She wrote down the rule below for Christa to follow.

$$(a+b)^3 = a^3 + b^3$$

Does Erin's shortcut always work? Justify your result **algebraically**.

$$(a+b)(a+b)(a+b)$$

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

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

$$a^3+2a^2b+ab^2+a^2b+2ab^2+b^3$$

$\boxed{\text{NO}}$ $a^3+3a^2b+3ab^2+b^3 \neq a^3+b^3$

2.) Algebraically prove that $\dfrac{x^3+9}{x^3+8} = 1 + \dfrac{1}{x^3+8}$

$$\frac{x^3+9}{x^3+8} = \frac{1}{1} + \frac{1}{x^3+8}$$

$$\frac{x^3+9}{x^3+8} = \frac{x^3+8}{x^3+8} + \frac{1}{x^3+8}$$

$$\frac{x^3+9}{x^3+8} = \frac{x^3+9}{x^3+8}$$ ✓

3.) Algebraically prove that: $x^3 - 2x^2 - 4x + 8 = (x+2)(x-2)^2$

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

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

$$(x-2)(x-2)(x+2) = (x+2)(x-2)^2$$

$$(x-2)^2(x+2) = (x+2)(x-2)^2 \checkmark$$

4.) Verify the following Pythagorean identity for all values of x and y:

$(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$

$$(x^2+y^2)^2 = (x^2-y^2)(x^2-y^2) + 4x^2y^2$$

$$(x^2+y^2)^2 = x^4 - x^2y^2 - x^2y^2 + y^4 + 4x^2y^2$$

$$(x^2+y^2)^2 = x^4 + 2x^2y^2 + y^4$$

$$(x^2+y^2)^2 = (x^2+y^2)(x^2+y^2)$$

$$(x^2+y^2)^2 = (x^2+y^2)^2 \checkmark$$