Using Laws of Exponents

The next skill that needs to be learned when dealing with polynomials is how to simplify expressions by applying the laws of exponents. The exponent laws that we will use in this section should be familiar to you from Algebra I, but it is wise to review. * Remember - you do NOT need like terms to multiply or divide *

Example	Law of Exponents
$x^2 \cdot x^3 \Rightarrow x \cdot x \cdot x \cdot x \cdot x = x^5$ $(x^{2+3} = x^5)$	$x^a + x^b = x^{a+b}$ $(x^a + y^b \neq xy^{a+b})$ * Need the same base
$(x^2)^3 \Rightarrow (x^2)(x^2)(x^2) = x^6$ $(x^{2\cdot 3} = x^6)$	$(x^a)^b = x^{ab}$
$(x \cdot y)^3 \Rightarrow (xy)(xy)(xy) = x^3y^3$ $((x \cdot y)^3 = x^3y^3)$	$(x \cdot y)^a = x^a y^a$ must be multiplication

This cannot be used with addition or subtraction

Ex $(x+y)^a \neq x^a + y^a$ ← Math sin

***Reminder**: $x = x^1$

***Note**: It is important to understand the difference between these two similar looking expressions. Simplify each.

$-4^2 \Rightarrow -1 \cdot 4^2 = -1 \cdot 16 = -16$ $\quad (-4)^2 \Rightarrow (-4)(-4) = 16$

If you want to square a negative number on your calculator, you must put that negative number in parentheses.

Break for Practice: Simplify

1. $c^4 \cdot c^2 = c^{4+2} = c^6$

2. $(mn^2)^4 = m^{1\cdot 4} n^{2\cdot 4} = m^4 n^8$

3. $(-x^5)^2 = (-1)^2 \cdot x^{5\cdot 2} = 1 \cdot x^{10} = x^{10}$

4. $5x^3 \cdot 2x^2 = (5 \cdot 2) x^{3+2} = 10x^5$

5. $(x^2y^3)^5 = x^{2\cdot 5} y^{3\cdot 5} = x^{10} y^{15}$

6. $(6m^4n^3)(2mn) = (6 \cdot 2)(m^{4+1})(n^{3+1}) = 12m^5n^4$

7. $(6c^2d^4e^5)^2 = 6^{1\cdot 2} c^{2\cdot 2} d^{4\cdot 2} e^{5\cdot 2} = 6^2 c^4 d^8 e^{10} = 36c^4d^8e^{10}$

8. $(2r^2)^3(3r)^2 = (2^{1\cdot 3} r^{2\cdot 3})(3^{1\cdot 2} r^{1\cdot 2}) = (8r^6)(9r^2) = 72r^8$

9. $3x^2(5x^2 + 3x - 2)$

$= (5\cdot3)x^{2+2} + (3\cdot3)x^{1+2} - (2\cdot3)x^2$

$= 15x^4 + 9x^3 - 6x^2$

10. $a^2b^3(3a^3 - 4a^2b - 2ab^2 + 2)$

$= 3a^{3+2}b^3 - 4a^{2+2}b^{1+3} - 2a^{1+2}b^{2+3} + 2a^2b^3$

$= 3a^5b^3 - 4a^4b^4 - 2a^3b^5 + 2a^2b^3$

Extended Practice: Simplify

1. $5r^2 \cdot r^4$ $5r^6$	2. $(-t^3)^4$ t^{12}
3. $(4p^2q)(p^2q^3)$ $4p^4q^4$	4. $(r^2s)(-3rs^3)(2rs)$ $-6r^4s^5$
5. $(2c^2d^3)^3$ $8c^6d^9$	6. $(-x^2yz^3)^4$ $x^8y^4z^{12}$
7. $(-c)^2(-c^4)$ $-c^6$	8. $(2x^2y^3)^3(3x^3y)^2$ $72x^{12}y^{11}$
9. $x^2(x - 2x^2 + 3x^3)$ $x^3 - 2x^4 + 3x^5$	10. $p^2q^3(p^2 - 4q)$ $p^4q^3 - 4p^2q^4$
11. $t^4 \cdot t^{k-4}$ t^k	12. $y^{p+2} \cdot y^p \cdot y^{p-2}$ y^{3p}
13. $x^3(x^{2k-1})^3$ x^{6k}	14. $rs^2(r^2 - 2rs - s^2)$ $r^3s^2 - 2r^2s^3 - rs^4$