Review–Overview of Simplification of Algebraic Expressions

Situation	*Important Concepts to Keep in Mind*	*Example: Fully Simplify the Given Expression*
Add/Subtract Polynomial Expressions *without* Brackets	• like/unlike terms • gains/losses • variable part does not change! • collect like terms	$-13x^2y-7xy+12x^2y-8xy$ $=-13x^2y+12x^2y-7xy-8xy$ $=-x^2y-15xy$
Add/Subtract Polynomial Expressions *with* Brackets	• first rewrite the expression without brackets • use $x-y=x+(-y)$ if necessary (subtraction is the same as adding the opposite • proceed as in previous row	$-(13x^2y-7xy)-(12x^2y-8xy)$ $=+(-13x^2y+7xy)+(-12x^2y+8xy)$ $=-13x^2y+7xy-12x^2y+8xy$ $=-13x^2y-12x^2y+7xy+8xy$ $=-25x^2y+15xy$
Multiply Monomials	• multiplication can be performed in ANY order! • rearrange the factors to make it easier to understand what the product should be	$(-13x^2y)(-7xy)(+12x^2y)(-8xy)$ $=-13(-7)(12)(-8)x^2x\,x^2x\,yyyy$ $=-8736x^6y^4$

Situation	*Important Concepts to Keep in Mind*	*Example: Fully Simplify the Given Expression*
Multiply/Divide Monomials	• laws of exponents: $a^x a^y = a^{x+y}$, $\frac{a^x}{a^y} = a^{x-y}$, $(a^x)^y = a^{xy}$, $(ab)^x = a^x b^x$, $\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$, $a^0 = 1$, $a^{-x} = \frac{1}{a^x}$ • see previous row as well	$\frac{27p^{11}q^2(-pq^5)}{3^{-2}(3^{-5}p^3q^{-1})^{-1}(482pqr)^0}$ $= \frac{-27p^{12}q^7}{3^{-2}(3^{-5})^{-1}(p^3)^{-1}(q^{-1})^{-1}(1)}$ $= \frac{-27p^{12}q^7}{3^{-2}(3^5)p^{-3}q^1}$ $= \left(\frac{-27}{3^3}\right)\left(\frac{p^{12}}{p^{-3}}\right)\left(\frac{q^7}{q^1}\right)$ $= -1p^{12-(-3)}q^{7-1}$ $= -p^{15}q^6$
Multiply a Monomial by a Polynomial	• Distributive Property $a(x+y) = ax+ay$ The factor outside the brackets is "distributed to" each term within brackets • like "signs" → product is positive • unlike "signs" → product is negative	$-2b^{-3}(5a^2b^3+3a^3b^6) - 7ab^{-6}(6a^2b^9 - ab^6)$ $= -10a^2 - 6a^3b^3 - 42a^3b^3 + 7a^2$ $= -10a^2 + 7a^2 - 6a^3b^3 - 42a^3b^3$ $= -3a^2 - 48a^3b^3$