Practice	Rules and Examples
Ex 1: $7a + -8a$ $-a$ Ex 2: $9x + 2x - 5x^2 + x^2$ $-4x^2+11x$ Ex 3: $3x + 4y + 2 - 7 - 3x^2 + 9y$ $-3x^2+3x+13y-5$	Combining Like Terms: When adding monomials that have the same base and same exponent, add the coefficients $m \cdot x + n \cdot x = (m+n) \cdot x$ $6x + 2x = (6+2)\,x = 8x$
Ex 1: $x^3 \cdot x^8$ x^{11} Ex 2: $2^4 \cdot 2^2 = 2^6 = 64$ Ex 2: $(2x^2y)(-3x^3y^4)$ $-6x^5y^5$ $2 \cdot 3 \cdot x^2 \cdot x^3 \cdot y \cdot y^4$	Product Rule: When multiplying monomials that have the same base, add the exponents. $x^m \cdot x^n = x^{m+n}$ $x^6 \cdot x^2 = x^{6+2} = x^8$
Ex 1: $\frac{3^5}{3^3} = 3^2 = 9$ Ex 2: $\frac{x^2y^5}{xy^3} = x^1y^2$ Ex 3: $\frac{36m^3n^5}{-9mn^4}$ $-4m^2n$	Quotient Rule: When dividing monomials that have the same base, subtract the exponents. $\frac{x^m}{x^n} = x^{m-n}$ $\frac{14x^6}{7x^2y^3} = \frac{14}{7}x^{6-2}y^{0-3} = 2x^4y^{-3}$
Ex 1: $(x^3)^2 = x^6$ Ex 2: $(3^5)^4 = 3^{20}$ Ex 3: $(z^5)^8 = z^{40}$	Power Rule: When raising monomials to powers, write the base and multiply the exponents. $(x^m)^n = x^{m \cdot n}$ $(x^6)^2 = x^{6 \bullet 2} = x^{12}$
Ex 1: $(2a)^5$ $32a^5$ Ex 2: $(6x^3)^2$ $36x^6$ Ex 3: $(2x^3yz^2)^3$ $8x^9y^3z^6$	Power of a Product Rule: When raising a product of monomials to powers, write each base and multiply the base's exponent with the outside exponent. $(ax^my^n)^4 = a^4x^{4m}y^{4n}$ $(2x^2y^3)^4 = 2^{1 \bullet 4}x^{2 \bullet 4}y^{3 \bullet 4} = 16x^8y^{12}$
Ex 1: $\left(\frac{x^2}{y}\right)^4$ $\frac{x^8}{y^4}$ Ex 2: $\left(\frac{2x}{3y^2}\right)^3$ $\frac{8x^3}{27y^6}$	Power of a Quotient Rule: When raising a division of monomials to powers, write each base where it is and multiply the base's exponent with the outside exponent. $\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$ $\left(\frac{3m^2n^7}{m}\right)^5 = \frac{3^{1 \cdot 5}m^{2 \cdot 5}n^{7 \cdot 5}}{m^{1 \cdot 5}} = \frac{243m^{10}n^{35}}{m^5}$ $\left(\frac{3m^2n^7}{m}\right)^5 = (3^{1(5)}\,m^{2(5)-1(5)}\,n^{7(5)}) = 3^5\,m^{10-5}\,n^{35} = 243m^5n^{35}$
Ex 1: $4^{-2} = \frac{1}{16}$ Ex 2: $-4x^5y^{-2}$ $-\frac{4x^5}{y^2}$ Ex 3: $\frac{a^{-2}b^3}{c^{-4}d^{-1}}$ $\frac{b^3c^4d}{a^2}$ Ex 4: $\left(\frac{x^2}{y}\right)^{-3}$ $\frac{y^3}{x^6}$	Negative Exponents: The Reciprocal of that factor. If a factor in the numerator or denominator is moved across the fraction bar, the sign of the exponent is changed. $x^{-m} = \frac{1}{x^m}$ $\frac{1}{x^{-m}} = x^m$ $\left(\frac{x}{y}\right)^{-n} = \left(\frac{y}{x}\right)^n$ $x^{-3} = \frac{1}{x^3}$ CAUTION: $-x \neq \frac{1}{x}$ For example: $-3 \neq \frac{1}{3}$
Ex 1: 7^0 1 Ex 2: $(5x^4\,y^0\,z^3\,z^{-3})^2$ $25x^8$	Zero Exponent: If a factor is raised to the power of 0, the result is 1 $x^0 = 1$ $(3x^3y^2)^0 = 1$

$3x^4 + 7x^4 = 10x^4$ Adding bases no change to exponent

$4^3 \cdot 8^4 \neq 8^7$

$\frac{4^8}{4^3} \neq 4^{11}$

$3^4 \cdot 3^2 = 3^{4+2}$ Multiplying bases Adding exponents

$\frac{4^8}{4^3} = 4^{8-3}$ Dividing bases Subtracting exp.

$(x^2)^3 \neq x^5$

$(x^3)^4 = x^{3 \cdot 4} = x^{12}$ exponent of base multiplying exp.

$(ab)^7 = a^7b$

$(3y^2)^4 = 3y^8$

$(3^1y^2)^4 = 3^{1 \cdot 4}y^{2 \cdot 4}$

$3y^2 \cdot 3y^2 \cdot 3y^2 \cdot 3y^2$ Distribute multiplication to each factor

$\left(\frac{4^6}{2^4}\right)^5 \neq \frac{4^{30}}{2^{11}}$

$\left(\frac{3^4}{13^2}\right)^5 = \frac{3^{4 \cdot 5}}{13^{2 \cdot 5}} = \frac{3^{20}}{13^{10}}$

$a^{-17} \neq \frac{1}{a^{-17}}$

$a^{-3} = \frac{1}{a^3}$

$2^{-3} \neq -8$

$(-2)^3 = -8$

$-2 \cdot -2 \cdot -2$

$(-67)^0 = 1$

$-67^0 = -1$

$0^0 \neq 1$

$\frac{0}{0}$ = undef.

$3^3 = 3 \cdot 3 \cdot 3 = 27$ (+1) ·3 ÷3

$3^2 = 3 \cdot 3 = 9$ (+1) ·3 ÷3

$3^1 = 3$ (-1) ·3 ÷3

$3^0 = \frac{3}{3} = 1$ (-1) ÷3

$3^{-1} = \frac{1}{3}$ (-1) ÷3

$3^{-2} = \frac{1}{3 \cdot 3} = \frac{1}{3^2} = \frac{1}{9}$ ÷3

$3^{-3} = \frac{1}{3^3} = \frac{1}{27}$

$\frac{1}{3} \div \frac{3}{1}$

$\frac{1}{3} \cdot \frac{1}{3}$

$2^{4/3} = \sqrt[3]{2^4} = (\sqrt[3]{2})^4$

$\sqrt[3]{64} = 64^{1/2} = 8$

$27^{2/3} = \sqrt[3]{27^2} = (\sqrt[3]{27})^2$

$= \sqrt[3]{27 \cdot 27}$

$= \sqrt[3]{27} \cdot \sqrt[3]{27}$

$= 3 \cdot 3$

$= 9$

$(3)^2$

9