

## Notes Laws of Exponents Day 2

Exponential Properties	Explanation	Example
Product of Powers	When multiplying powers with the same base, you <u>Add</u> the exponents	$a^m \cdot a^n = a^{m+n}$ $(a^6)(a^1)$ $a^7$
Quotient of Powers	When dividing powers with the same base, you <u>subtract</u> the exponents	$\frac{a^m}{a^n} = a^{m-n}$ $\frac{x^{10}}{x^4}$ $x^6$
Zero Exponents	When evaluating a power with an exponent of zero, the answer will be <u>1</u>	$a^0 = 1$ $x^0$ $1$
Negative Exponents	Powers with negative exponents can be written as a <u>reciprocal</u> with a positive Exponent	$a^{-m} = \frac{1}{a^m}$ $\frac{1}{a^{-m}} = a^m$ $\frac{x^{-2}}{1} = \frac{1}{x^2}$
Power of a Power	When raising a power to another power, you <u>multiply</u> the exponents	$(a^m)^n = a^{m \cdot n}$ $(x^3)^3$ $x^9$ $(x^3)(x^3)(x^3)$

Examples:

$(3x^2)^4$ $3^4 \cdot x^8$ $81x^8$	$(6x^3y)^2$ $6^2 \cdot x^6 \cdot y^2$ $36x^6y^2$	$(x^2y^3z)^3$ $x^6y^9z^3$	$(3x^2)^0$ $3(x^2)^0$ $3x^0 = 3 \cdot 1 = 3$
$(x^3y^4)^{-2}(x^{-3}y^{-5})^{-4}$ $x^{-6} \cdot y^{-8} \cdot x^{12} \cdot y^{20}$ $(x^{-6} \cdot x^{12})(y^{-8} \cdot y^{20})$ $x^6 \cdot y^{12}$	$(5^{-1}x^3)^{-2}$ $5^2x^{-6}$ $\frac{25}{x^6}$	$(12x^{-2})^2$ $12^2x^{-4}$ $\frac{144}{x^4}$	$3x \cdot (x^{-2})^5$ $3(x^1 \cdot x^{-10})$ $3x^{-9} = \frac{3}{x^9}$

1) $(3x^2)^0$ 1	2) $(4y^2)^3$ $64y^6$	3) $(3x^{-2}y^5)^4$ $3^4 x^{-8} y^{20}$ $\frac{81y^{20}}{x^8}$	4) $(4xy^2)^{-2}$ $4^{-2} x^{-2} y^{-4}$ $\frac{1}{16x^2y^4}$
5) $\left(\frac{3xy^5}{2x^4y^{-2}}\right)^2$ $\frac{3^2 x^2 y^{10}}{2^2 x^8 y^{-4}} = \frac{9y^{14}}{4x^6}$	6) $\left(\frac{3xy^5}{2x^4y^{-2}}\right)^{-2}$ $\frac{3^{-2} x^{-2} y^{-10}}{2^{-2} x^{-8} y^4} = \frac{4x^6}{9y^{14}}$	7) $\left(\frac{4x^9y^{-3}}{5x^{-4}y^2}\right)^3$ $\frac{64x^{27}}{125y^{15}}$	8) $(x^2y^{-3})^2$ $\frac{x^4}{y^6}$
9) $\left(\frac{3xy^5}{2x^4y^{-2}}\right)^0$ 1	10) $(3x^{-3}y)^4$ $\frac{x^{12}}{81y^4}$	11) $(7xy^0)^2$ $49x^2$	12) $(11x^{-3}y^5)^{-2}$ $\frac{x^6}{121y^{10}}$

**Rational Exponents**  $\frac{\text{power}}{\text{root}}$

$\left(\sqrt[3]{8}\right)^5 = (8)^{5/3}$

Write expression using rational exponents AND use calculator to estimate its value (round to the nearest tenth).

a) $(\sqrt[4]{12})^5$ <del>(12)</del> $(12)^{5/4}$	b) $(\sqrt[2]{25})^3$ $(25)^{3/2}$	c) $(\sqrt[5]{32})^7$ $(32)^{7/5} = 128$	d) $(\sqrt[3]{24})^4$ $(24)^{4/3} = 69.2$
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Rewrite the expression in radical form.

e) $15^{3/4}$ $(\sqrt[4]{15})^3$	f) $(-25)^{5/6}$ $(\sqrt[6]{-25})^5$	g) $(2)^{6/11}$ $(\sqrt[11]{2})^6$ 1.46	h) $(-12)^{5/8}$ Not real <del><math>(\sqrt[8]{-12})^5</math></del>
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Simplify the Expression

i) $5^{-3/2} \cdot 5^{6/5}$ $5^{-3/10}$	j) $\left(\frac{1}{16}\right)^{1/2}$ .25	k) $(3)^{5/6} \cdot (3)^{-4/5}$ 1.04	l) $\left(\frac{4}{25}\right)^{3/2} \cdot \left(\frac{4}{25}\right)^{4/5}$ .01
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