

Algebra II

5.1 Exponents

Obj: To understand and use the rules of exponents.

$$x^5 = x \cdot x \cdot x \cdot x \cdot x$$

$$2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$$

Examples:

$$x^5 \cdot x^4 = x^9 \qquad 2^5 \cdot 2^8 = 2^{13} = 8192$$

$$3x^8 \cdot 5x^4 = 15x^{12} \qquad 10xy^2 \cdot 5x^4y^5w^8 = 50x^5y^7w^8$$

$$x^m \cdot x^n = x^{m+n}$$

Examples:

$$\frac{x^5}{x^2} = x^3$$

$$\frac{x^5}{x^{12}} = x^{-7} = \frac{1}{x^7}$$

$$\frac{3x^4}{12x} = \frac{1x^3}{4}$$

$$\frac{4x^8y^2}{10x^2y^7} = \frac{2x^6}{5y^5}$$

$$\frac{x^m}{x^n} = x^{m-n}$$

Examples:

$$(x^4)^2 = x^8$$

$$(2^4)^3 = \cancel{16} = 4096$$

$$(3x^4)^2 = 9x^8$$

$$(3x^2y^5w)^4 = 81x^8y^{20}w^4$$

$$(x^m)^n = x^{mn}$$

Rules of Exponents (So far):

$$x^m \cdot x^n = x^{m+n}$$

$$\frac{x^m}{x^n} = x^{m-n}$$

$$(x^m)^n = x^{mn}$$

Zero Exponents: $= \underline{1}$

$$\frac{x^8}{x^8} = x^0 = \underline{1} \quad x^0 = \underline{1}$$

$$9^0 = \underline{1} \quad (3wy^4)^0 = \underline{1}$$

$$x^0 = \underline{1} \quad 0^0 = \underline{1}$$

Negative Exponents:

$$x^{-3} = \frac{1}{x^3} \quad \frac{1}{x^{-3}} = x^3 \quad 4^{-2} = \frac{1}{4^2} = \frac{1}{16}$$

$$\frac{1}{5^{-3}} = 5^3 \quad \left(\frac{6}{x^3}\right)^{-1} \frac{6^{-1}}{x^3} = \frac{x^{-3}}{6} \left(\frac{6}{x^3}\right)^{-2} = \frac{x^6}{36}$$

Negative Exponents (Don't leave a negative exponent in your answer!!!):

$$\begin{aligned} (-6x^3y^{-4})(5x^{-7}y^6) &= -\frac{-30y^2}{x^4} & \left(\frac{2w^{-1}}{5x^4}\right)^{-2} &= \frac{4w^2}{25x^8} = \frac{4w^2x^8}{25} \end{aligned}$$

$$\frac{3x^3y^6z^4}{12x^4yz^7} = \frac{1y^5}{4xz^3} \quad \frac{-3x^{-3}y^{-6}z^{-4}}{12x^{-4}yz^{-7}} = \frac{-1xz^3}{4y^5}$$