Section 5.1 - Exponent Rules

$x^n = \underbrace{x \cdot x \cdot x \cdot \ldots \cdot x}_{n\text{-times}}$ $\quad 3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$

Ex) $(-2x)^3$ Base $= -2x$, Exp $= 3$

Ex) 5^4 Base: 5, Exp $= 4$

Ex) t^{10} Base: t, Exp: 10

Ex) $5 \cdot t \cdot t \cdot t$

Ex) $6^2 \cdot 6^3$

Ex) $9^5(9^6)$

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

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

Ex) $\frac{4^5}{4^2}$

Ex) $\frac{x^9}{x^3}$

Ex) $\frac{a^3 a^5 a^7}{a^4 a^2}$

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

Ex) $(3^2)^4$

Ex) $(z^2)^3$

Ex) $((-6)^2)^5$

Rule: $(xy)^n = x^n y^n$

Rule: $x^1 = x$

Rule: $\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$

Ex) $(3c)^3$

Ex) $(x^2 y^3)^3$

Ex) $\left(-\frac{1}{4} a^3 b\right)^2$

Ex) $\left(\frac{x}{7}\right)^3$, $\left(\frac{2x^3}{3y^2}\right)^4$

Ex)

Section 5.2 - Zero and Negative Exponents

Rules $x^0 = 1$ for any $x \neq 0$

$x^{-n} = \frac{1}{x^n}$ for $x \neq 0$

$\frac{x^{-m}}{y^{-n}} = \frac{y^n}{x^m}$ for $x, y \neq 0$

Rules $\left(\frac{x}{y}\right)^{-n} = \left(\frac{y}{x}\right)^n$

Ex) 8^{-2}, x^{-5}, $(-3)^{-3}$, 2^{-3}, 4^0

Ex) $9m^{-3}$, -5^{-2}, $12h^{-9}$, -2^{-4}

Ex) $\frac{1}{d^{-10}}$, $\frac{2^{-3}}{2^{-4}}$, $\frac{-6s^{-2}}{t^{-9}}$, $\frac{1}{w^{-5}}$, $\frac{-8h^{-6}}{a^{-7}}$

Ex) $\left(\frac{4}{m}\right)^{-2}$ $\left(\frac{c}{9}\right)^{-2}$

Ex) $x^5 \cdot x^{-3}$, $(2a^3b^{-5})^3$, $(x^3)^{-2}$, $\left(\frac{c}{2}^4\right)^{-3}$

$(4c^2d^{-1})^3$, $\left(\frac{k^6}{6}\right)^{-3}$, $(5g^3h^{-1})^3$

Ex) $\frac{y^{-4}y^{-3}}{y^{-20}}$, $\frac{7^{-1}a^3b^4}{6^{-2}a^5b^2}$, $\left(\frac{x^{-3}y^2}{xy^{-3}}\right)^2$

Ex) $\frac{a^{-4}a^{-5}}{a^{-3}}$, $\frac{1^{-4}(x^5)(y^3)}{9^{-2}x^3y^6}$ $\left(\frac{c^{-2}d^2}{c^4d^{-3}}\right)^3$

Section 5.3 - Scientific Notation

Power of 10	10^4	10^3	10^2	10^1	10^0	10^{-1}	10^{-2}	10^{-3}
Value	10,000	1,000	100	10	1	$\frac{1}{10} = .1$	$\frac{1}{100} = .01$	$\frac{1}{1000} = .001$

Ex) 3.67×10^2 Ex) 2.158×10^{-3} Ex) 4.0×10^{57}

Ex) 150,000,000 Ex) 0.00000256 Ex) 432×10^5

Always $A \times 10^b$ A is in $[1, 10)$, b an integer

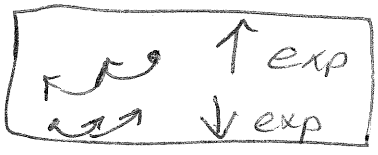
Ex.) .00009055, Ex) 88×10^{-3}, Ex) 9000,000

Light from Sirius reaches Earth in 70,000 hours
If light travels 670,000,000 mph, How far from Earth is Sirius?

Ex) Use Sci Notation to do $(2{,}540{,}000{,}000{,}000)(.00041)$
Ans: 1.0414×10^9

Rules: $(a \times 10^m)(b \times 10^n) = (a \cdot b) \times 10^{m+n}$

$\frac{(a \times 10^m)}{(b \times 10^n)} = \left(\frac{a}{b}\right) \times 10^{m-n}$



Ex) $(3 \times 10^5)(4 \times 10^6)$

Section 5.4 - Polynomials

A **polynomial** is a sum of terms in which all variables have **whole number exponents**.

Ex) $3x-2$ $\quad ax^2+bx+c$

x^2+3x+3

Monomial	Binomial	Trinomial
$6x$	$9x-3$	$5t^2-3t+1$
$5x^3y^2$	72^4-2^2	x^3+x^2+x
11	$18a^2b+4ab$	$\frac{1}{2}x^2+x+1$

The **degree** of a polynomial is the value of the highest exponent of the variable

Ex) x^2+x+1 degree 2 $\quad (x+5)^8$ degree 8

x^3+1 degree 3 $\quad (x+2)(x-1)^3$ degree 4

Evaluate: $3x^2+4x-5$ for $x=0$, $x=-2$

$3p^2q-4pq^2$ for $p=2$, $q=-3$

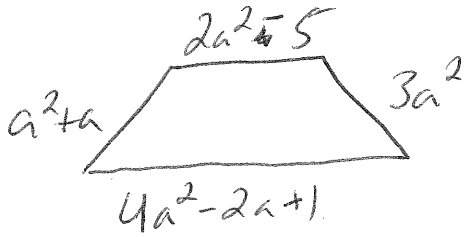
Graph: $y=x^2$, $y=x^2-2$ (by table), $y=x^3+1$, $y=x^3$

Section 5.5 - Adding / Subtracting Polynomials

Ex) $(3x^2+6x+7)+(2x-5)$

$(-6a^3+5a^2-7a+9)+(4a^3-5a^2-a-8)$

Find a polynomial that represents the perimeter of the trapezoid



Ex) $4x^2-3$ and $3x^2-8x+8$ in vertical form.

$4q^2-7$ and $2q^2-8q+9$ " "

Ex) $-(2a^2-a+9)$

$(3a^2-4a-6)-(2a^2-a+9)$

$(8a^3-5a^2+5)-(a^3-a^2-7)$

$(x^2y-2x+y-2)-(6x+9y-2)$

Ex) $3x^2-2x$ from $2x^2+4x+1$

$4x^3-6x^2+x$ from $7x^3-2x$

$3x^8-2xy^3-4x$ from $3x-4xy^3+10x^8$

Fraction Examples

Section 5.6 – Multiplying Polynomials

Ex) $6r \cdot r$, $3t^4(-2t^5)$, $\left(\frac{1}{3}a^2b^3\right)(21ab^2)$

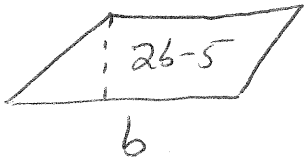
$-4y^5z^2(2y^3z^3)(3yz)$

Ex) $3n^6(16n^{15}+n^{10})$

$-2xz^3(6x^3z+x^2z^2-xz^3+7z^4)$

$3a^2(3a^2-5a+2)$

Find a polynomial that gives area of the parallelogram



Binomials

$(2a+4)(3a+5)$

$(5x-8)(x+1)$

FOIL

First, Outer, Inner, Last

$(3x+1)(2x-3)$

Ex) $(2r-\frac{1}{2})(2r+\frac{5}{2})$

$(x+5)(x+7)$

$(5az+3bz)(4a+3b)$

$(3x+4)(2x-3)$

$(3a^2-7b)(a^2-b^2)$

Ex) $(7y+3)(6y^2-8y+1)$

$(3a^2-1)(2a^4-a^2-a)$

$-3a(4a+1)(a+1)$

$(3a^2-4a+7)(2a+5)$

$(6y^3-5y+4)(-4y^2-3)$

$-2y(y+3)(3y-2)$