Math 115

Fall 2017

Lecture 17

Use exponential rules to simplify

1) $(x^7)^4 x^2 = x^{28} \cdot x^2 = \boxed{x^{30}}$

2) $\dfrac{(x^4)^4}{(x^5)^3} = \dfrac{x^{16}}{x^{15}} = x^1 = \boxed{x}$

3) $(x^{-6})^5 = x^{-30} = \boxed{\dfrac{1}{x^{30}}}$

4) $(-4x^5y^6)^3$

$= (-4)^3 (x^5)^3 (y^6)^3$

$= \boxed{-64x^{15}y^{18}}$

Monomial

$D = 15 + 18 = 33$

$C = -64$

5) $\left(\frac{5x^4}{y^{10}}\right)^3 = \frac{5^3(x^4)^3}{(y^{10})^3}$

$= \boxed{\frac{125x^{12}}{y^{30}}}$

6) $\frac{-85\,x^{-4}y^{12}}{34\,x^{10}y^{-2}}$

$= \frac{-17\cdot 5\; y^{12}y^2}{17\cdot 2\; x^{10}x^4}$

$= \frac{-5\,y^{14}}{2\,x^{14}}$

7) $\left(\frac{2x}{y^6}\right)^{-4}$

$= \left(\frac{y^6}{2x}\right)^4 = \boxed{\frac{y^{24}}{16x^4}}$

8) $\left(\frac{-3x^{-5}}{2y^{-4}}\right)^{-3}$

Hint: Always take care of negative exponent inside of ( ).

$= \left(\frac{-3y^4}{2x^5}\right)^{-3} = \left(\frac{2x^5}{-3y^4}\right)^3 = \frac{2^3(x^5)^3}{(-3)^3(y^4)^3}$

$= \boxed{-\frac{8x^{15}}{27y^{12}}}$

Scientific Notation

It is used to express large # or small #

$N \times 10^{n}$

- N: $1 \le N < 10$
- n: an integer $\ldots, -5, -4, -3, -2, -1, 0, 1, 2, \ldots$

4.5×10^{18} → Very large

3.75×10^{-12} → Very small

$4500000000 = 4.5 \times 10^{8}$ Large #

8 places

$0.0000000000000375 = 3.75 \times 10^{-13}$ Small #

13 places

When working with S.N., It is ok to have negative exponent.

Simplify

$(2.5 \times 10^{14}) \cdot (1.2 \times 10^{26})$

$= 3 \times 10^{14+26} = \boxed{3 \times 10^{40}}$

$(6.8 \times 10^{-17}) \cdot (4.5 \times 10^{-10})$

$= 30.6 \times 10^{-17+(-10)} = 30.6 \times 10^{-27}$

$= 3.06 \times 10^{1} \times 10^{-27}$

$\Rightarrow = \boxed{3.06 \times 10^{-26}}$

Simplify

$$\frac{5 \times 10^{23}}{2 \times 10^{-5}} = 2.5 \times 10^{23-(-5)}$$

$$= \boxed{2.5 \times 10^{28}}$$

$$\frac{7.5 \times 10^{-14}}{3 \times 10^{18}} = 2.5 \times 10^{-14-18}$$

$$= \boxed{2.5 \times 10^{-32}}$$

Simplify $\dfrac{2.5 \times 10^{8}}{8 \times 10^{25}}$

$= 0.3125 \times 10^{8-25}$

It has to be between 1 & 10

$= 3.125 \times 10^{-1} \times 10^{-17}$

$= \boxed{3.125 \times 10^{-18}}$

Give Degree & Coef.

1) x^5 D=5 C=1

2) $5x$ D=1 C=5

3) 2017 Constant D=0

4) $-4x^6y^4$ D=6+4=10 C=-4

5) $\frac{3}{5}xy^2z^7$ D=1+2+7=10 C=$\frac{3}{5}$

6) $w^1x^1y^1z^1$ D=1+1+1+1=4 C=1

Make a table, find D & C, then determine D and L.C.

$-5x^4 + 12x^2 - 10x + 15$

Monomials	D	C
$-5x^4$	4	-5
$12x^2$	2	12
$-10x$	1	-10
15	0	Constant

D = 4

L.C. = -5

Make a table, find D & C, then determine D and L.C.

$x^2y^3 - 40x^6y^2 - 40xy^2 + 8$

Monomials	D	C
x^2y^3	2+3 = 5	1
$-40x^6y^2$	6+2 = 8	-40
$-40xy^2$	1+2 = 3	-40
8	0	Constant

D = 8

L.C. = -40

Distribute & Simplify

Do not use ϕ for 0.

1) $4(x^2-3x+5)-2(2x^2-6x+10)$

$= 4x^2-12x+20-4x^2+12x-20 = \boxed{0}$

2) $3x^4(2x^2-6x+7)+18x^5$

$= 3x^4\cdot 2x^2 - 3x^4\cdot 6x^1 + 3x^4\cdot 7 + 18x^5$

$= 6x^6 - 18x^5 + 21x^4 + 18x^5$

Binomial

D=6, LC=6

$= \boxed{6x^6 + 21x^4}$

3) $-4x^5(2x^2-5x+1)+8x^7+4x^5$

$= -8x^7 + 20x^6 - 4x^5 + 8x^7 + 4x^5$

$= \boxed{20x^6}$

Monomial

D=6, C=20

Foil & Simplify

$x\cdot x = x^1\cdot x^1 = x^{1+1} = x^2$

1) $(2x^1+3)(3x^1+2) = 6x^2+4x+9x+6$

Trinomial

D=2, L.C.=6, Const=6

$= \boxed{6x^2+13x+6}$

2) Multiply:

$(5x-7)(5x+7) = 25x^2 + 35x - 35x - 49$

Conjugates

$= 25x^2 - 49$

Binomial

D=2, L.C.=25,

Const. -49

3) Multiply: Final Ans in descending order

$(2x^3 - 5)(3x^2 + 4)$

$= 6x^5 + 8x^3 - 15x^2 - 20$

Polynomial, D=5, L.C.=6, Constant -20

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

$= x^3 \cdot x^3 + x^3 \cdot x^2 - x^2 \cdot x^3 - x^2 \cdot x^2$

$= x^6 + x^5 - x^5 - x^4 = \boxed{x^6 - x^4}$

Binomial

D=6

L.C.=1

No constant.

Special Product:

$$(A+B)^2 = A^2 + 2AB + B^2$$

$$(x+5)^2 = x^2 + 2 \cdot x \cdot 5 + 5^2$$

$$= \boxed{x^2 + 10x + 25}$$

$$(4x+3)^2 = (4x)^2 + 2(4x)(3) + (3)^2$$

$$= 16x^2 + 24x + 9$$

$$(x^6 + x^2)^2 = (x^6)^2 + 2(x^6)(x^2) + (x^2)^2$$

$$= \boxed{x^{12} + 2x^8 + x^4}$$

Trinomial

D = 12, LC = 1, No Constant

$$(5x^4 + 1)^2 = (5x^4)^2 + 2(5x^4)(1) + (1)^2$$

Trinomial

D = 8

L.C. = 25 Const = 1

$$= \boxed{25x^8 + 10x^4 + 1}$$

Special Product:

$$(A - B)^2 = A^2 - 2AB + B^2$$

$$(x - 10)^2 = x^2 - 2(x)(10) + (10)^2$$

$$= \boxed{x^2 - 20x + 100}$$

$$(5x - 3y)^2 = (5x)^2 - 2(5x)(3y) + (3y)^2$$

$$= \boxed{25x^2 - 30xy + 9y^2}$$

$$(4x^5 - 3x^2)^2 = (4x^5)^2 - 2(4x^5)(3x^2) + (3x^2)^2$$

$$= \boxed{16x^{10} - 24x^7 + 9x^4}$$

$$(11x^{10} - 1)^2 = (11x^{10})^2 - 2(11x^{10})(1) + (1)^2$$

$$= 121x^{20} - 22x^{10} + 1$$

Trinomial D=20 L.C. 121 Const 1

Special Product:

$$(A-B)(A+B) = A^2 - B^2$$

Conjugate

$$(x+8)(x-8) = (x)^2 - (8)^2$$
$$= x^2 - 64$$

$$(4x^2+10)(4x^2-10)$$
$$= (4x^2)^2 - (10)^2$$
$$= 16x^4 - 100$$

Binomial
D=4
L.C.=16
Const. -100

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

$$= (x^2+4)(x^2-4) = (x^2)^2 - (4)^2$$
$$= x^4 - 16$$

Conjugates