Math 115

Spring 2017

Lecture 17

Use Exponential rules to Simplify:

① $(-4x^5y^2)^3$

$= (-4)^3(x^5)^3(y^2)^3 = \boxed{-64x^{15}y^6}$

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

$= \boxed{\frac{16x^{16}}{y^{28}}}$

③ $\frac{-42x^7y^{12}}{6x^3y^{20}}$

$= \boxed{-\frac{7x^4}{y^8}}$

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

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

$= \frac{x^6y^{15}}{-27} = \boxed{-\frac{x^6y^{15}}{27}}$

⑤ $(x^{-2})^4 \cdot (x^6)^5$

$= x^{-8} \cdot x^{30}$

$= x^{-8+30} = \boxed{x^{22}}$

⑥ $\dfrac{(-3x^2)^4}{(9x^4)^2} = \dfrac{81x^8}{81x^8}$

$= \boxed{1}$

⑦ $(2.75 \times 10^{25}) \cdot (8.2 \times 10^{-10})$

$= 22.55 \times 10^{15}$

$= 2.255 \times 10^{1} \times 10^{15} = \boxed{2.255 \times 10^{16}}$

⑧ $\dfrac{3.5 \times 10^{-20}}{7 \times 10^{15}} = .5 \times 10^{-35} = 5 \times 10^{-1} \times 10^{-35}$

$= \boxed{5 \times 10^{-36}}$

Give Degree and Coef.

① $-12x^4$ Monomial

Degree = 4

Coef. = −12

② $25x^9y^1$ Monomial

Degree = 9+1 = 10

Coef. = 25

③ $2x^6 - 10x^2$ D = 6 Binomial

D = 6, C = 2

D = 2, C = −10

L.C. = 2

④ $12x^3 - 100x^2 + 400$

D = 3, C = 12

D = 2, C = −100

Constant, D = 0

⑤ $17x^6y^8 - 10x^3y^7 + 2000xy - 100$ Trinomial

D = 3, L.C. = 12

D = 14, C = 17

D = 10, C = −10

D = 2, C = 200

Constant, D = 0

D = 14, LC = 17 Polynomial

Use $(A+B)^2 = A^2 + 2AB + B^2$ to find

① $(7x+5)^2$

$= (7x)^2 + 2(7x)(5) + (5)^2$

$= \boxed{49x^2 + 70x + 25}$

② $(4x^3 + 3x^2)^2$

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

$= \boxed{16x^6 + 24x^5 + 9x^4}$

③ $(5x^3y^6 + 2)^2$

$= (5x^3y^6)^2 + 2(5x^3y^6)(2) + (2)^2$

$= 25x^6y^{12} + 20x^3y^6 + 4$

Trinomial

$D = 6 + 12 = 18$

L.C. = 25, Const. = 4

Use $(A-B)^2 = A^2 - 2AB + B^2$ to find

① $(3x-5)^2$

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

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

② $(6x^4 - 2x)^2$

$= (6x^4)^2 - 2(6x^4)(2x) + (2x)^2$

$= \boxed{36x^8 - 24x^5 + 4x^2}$

③ $(4x^2y - 3xy^3)^2$

$= (4x^2y)^2 - 2(4x^2y)(3xy^3) + (3xy^3)^2$

$= \boxed{16x^4y^2 - 24x^3y^4 + 9x^2y^6}$

$D = 8$

L.C. = 9

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

Conjugates

Use the formula above to find

① $(4x+5)(4x-5)$

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

$= 16x^2 - 25$

② $(3x^2-7)(3x^2+7)$

$= (3x^2)^2 - (7)^2$

$= \boxed{9x^4 - 49}$

③ $(x^2-2)(x^2+2)(x^4+4)(x^8+16)$

$= (x^4-4)(x^4+4)(x^8+16) = (x^8-16)(x^8+16)$

$= \boxed{x^{16} - 256}$

Divide:

$$\frac{32x^5 - 24x^3 + 16x^2}{4x^2}$$

$$= \frac{32x^5}{4x^2} - \frac{24x^3}{4x^2} + \frac{16x^2}{4x^2} = 8x^3 - 6x + 4$$

Trinomial

D=3, L.C.=8

Const. 4

$$\frac{28x^7y^3 - 14x^5y^8 + 49x^5y^3}{-7x^5y^3}$$

D=5

L.C=2

Const. -7

Trinomial

$$= \frac{\cancel{28}^{4}x^7y^3}{-\cancel{7}x^5\cancel{y^3}} - \frac{\cancel{14}^{2}x^5\cancel{y^8}}{-\cancel{7}x^5\cancel{y^3}} + \frac{49x^5y^3}{-7x^5y^3} = -4x^2 + 2y^5 - 7$$

SG 13 Due Wednesday

SG 14 Due Thursday

Quiz on both days.

Long Division

Polynomial / Polynomial except monomial

$$\frac{4x^4 - 2x^3 + 7x - 2}{x + 2}$$

$$\frac{x^2 - 5x + 6}{x - 1}$$

$$\frac{x^3 + 2x^2 - 4x + 3}{2x + 1}$$

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ex: $\frac{x^2 - 7x + 12}{x - 4}$

① order ✓

② If there is a missing term, use 0 for that place ✓

$$x - 4 \overline{)\, x^2 - 7x + 12}$$

$x - 3$

$x \cdot x = x^2$ $\quad -(x^2 - 4x)$

$-3x + 12$

$x \cdot (-3) = -3x$ $\quad -(-3x + 12)$

Rem. → 0

Final Ans $\boxed{x - 3}$

$$\frac{2x^3 - 4x + 3x^2 - 8}{x+2} = \frac{2x^3 + 3x^2 - 4x - 8}{x+2}$$

order ✓

Missing term ✓

$$x+2 \;\overline{)\; 2x^3 + 3x^2 - 4x - 8}$$

$2x^2$

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

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

$-x^2 - 4x - 8$

$-x$

$x \cdot (-x) = -x^2$

$-(-x^2 - 2x)$

$-2x - 8$

-2

$x \cdot (-2) = -2x$

$-(-2x - 4)$

Remainder → -4

Final Ans:

$$2x^2 - x - 2 + \frac{-4}{x+2}$$

Divide:

$$\frac{3x^3 + 2x^2 - 5}{x-1} = \frac{3x^3 + 2x^2 + 0x - 5}{x-1}$$

Order ✓

Missing term: x

$$x-1 \;\overline{)\; 3x^3 + 2x^2 + 0x - 5}$$

$3x^2$

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

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

$5x^2 + 0x - 5$

$5x$

$x \cdot 5x = 5x^2$

$-(5x^2 - 5x)$

$5x - 5$

5

$x \cdot 5 = 5x$

$-(5x - 5)$

0

Final Ans

$3x^2 + 5x + 5$

Divide:

$$\frac{4x^2 - 5x - 7}{x + 4}$$

$$x+4 \overline{)\, 4x^2 - 5x - 7}$$

$4x - 21$

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

$-21x - 7$

$-(-21x - 84)$

77

$x \boxed{4x} = 4x^2$

$x \boxed{-21} = -21x$

$$4x - 21 + \frac{77}{x+4}$$

Divide:

$$\frac{9x^3 - 3x^2 - 3x + 4}{3x + 2}$$

$$3x+2 \overline{)\, 9x^3 - 3x^2 - 3x + 4}$$

$3x^2 - 3x + 1$

$-(9x^3 + 6x^2)$

$-9x^2 - 3x + 4$

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

$3x + 4$

$-(3x + 2)$

2

$3x \boxed{3x^2} = 9x^3$

$3x \boxed{-3x} = -9x^2$

$3x \boxed{1} = 3x$

$$3x^2 - 3x + 1 + \frac{2}{3x+2}$$

Divide

$\frac{x^3+64}{x+4} = \frac{x^3+0x^2+0x+64}{x+4}$

"Be aware of missing terms"

$x \cdot \boxed{x^2} = x^3$

$x \cdot \boxed{-4x} = -4x^2$

$x \cdot \boxed{16} = 16x$

$$\begin{array}{r} x^2-4x+16 \\ x+4 \overline{)\, x^3+0x^2+0x+64} \\ -(x^3+4x^2) \\ \hline -4x^2+0x+64 \\ -(-4x^2-16x) \\ \hline 16x+64 \\ -(16x+64) \\ \hline 0 \end{array}$$

$\boxed{x^2-4x+16}$

Find A & P:

$A = LW$

$P = 2L+2W$

$10x^3+4x^2$

$10x^3-4x^2$

$A = (10x^3+4x^2)(10x^3-4x^2)$

Conjugates

$= (10x^3)^2 - (4x^2)^2$

$= \boxed{100x^6 - 16x^4}$

$P = 2(10x^3+4x^2) + 2(10x^3-4x^2)$

$= 20x^3+8x^2+20x^3-8x^2$

$\boxed{P = 40x^3}$

Find A & P

$A = S^2$

$P = 4S$

$5x^3+3$

$5x^3+3$

$A = (5x^3+3)^2$

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

$A = 25x^6 + 30x^3 + 9$

$P = 4(5x^3+3) = 20x^3+12$

Class Quiz:

① Simplify: $(-2x^3)^5 \cdot 5x^2$

② Simplify: $\dfrac{x^4 y^{-6}}{x^{-3} y^4}$

③ $(6.8 \times 10^{12}) \cdot (5.5 \times 10^{17})$