Math 115

Winter 2017

Lecture 11

Use exponential rules to Simplify:

1) $(x^4)^3 \cdot x^8$

Monomial

$= x^{12} \cdot x^8$

$= \boxed{x^{20}}$ Deg.=20 Coef.=1

2) $\dfrac{(x^2)^5}{(x^3)^3} = \dfrac{x^{10}}{x^9}$ Deg.=1

$= x^{10-9} = x^1 = \boxed{x}$ Coef.=1 Mono.

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

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

$= \boxed{-8x^{15}}$ Monomial Deg. 15 Coef.=-8

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

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

$= \boxed{\dfrac{16y^{20}}{x^{12}}}$ Not a monomial

5) $(-3x^6y^5)^2$ Monomial

$= (-3)^2(x^6)^2(y^5)^2$ Deg. $= 12+10 =$ 22

$= \boxed{9x^{12}y^{10}}$ Coef. $= 9$

6) $(x^4)^{-3} \cdot x^{-5}$

$= x^{-12} \cdot x^{-5} = x^{-17} = \boxed{\frac{1}{x^{17}}}$

Not a Monomial

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

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

$= \frac{x^6y^{15}}{-125} = \boxed{\frac{-1}{125}x^6y^{15}}$

Monomial

Deg. $= 6+15 = 21$

Coef. $\frac{-1}{125}$

8) $\left(\frac{2}{3}\right)^0 - \left(\frac{1}{2}\right)^{-2}$

$= 1 - \left(\frac{2}{1}\right)^2$

$= 1 - 2^2$

$= 1 - 4$

$= \boxed{-3}$

Write in S.N.:

① $235{,}000{,}000{,}000$

$= 2.35 \times 10^{10}$

② 0.000000000000789

$= 7.89 \times 10^{-11}$

Write in expanded form

① 2.5×10^8

$= 250{,}000{,}000$

② 1.75×10^{-5}

0.00001175

Simplify:

① $(7.8 \times 10^{12})(8.5 \times 10^{27})$

$= 66.3 \times 10^{39} = 6.63 \times 10^{1} \times 10^{39} = \boxed{6.63 \times 10^{40}}$

② $\dfrac{3.5 \times 10^{-18}}{7 \times 10^{14}} = .5 \times 10^{-32} = 5 \times 10^{-1} \times 10^{-32}$

$= \boxed{5 \times 10^{-33}}$

Multiply & Simplify:

1) $(-7x^5)(4x^3) = -28x^{5+3} = -28x^8$

Monomial, Deg.=8

Coef.=-28

2) $(-8x^2y^6)(-4x^3y^4)$

$= 32x^{2+3}y^{6+4} = 32x^5y^{10}$

Monomial

Deg.=5+10=15

Coef.=32

Distribute & Simplify

3) $-4x(2x^2-3x+1)+8x^3-13x^2$

$= -8x^3+12x^2-4x+8x^3-13x^2 = \boxed{-x^2-4x}$

Binomial, Deg.2, L.C.=-1

Foil & Simplify

① $(5x+3)(4x-6)$

$= 20x^2 - 30x + 12x - 18$

$= \boxed{20x^2 - 18x - 18}$

Trinomial, D=2, L.C=20, Const.-18

② $(3x^2-1)(4x^2-5)$

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

$= \boxed{12x^4 - 19x^2 + 5}$ Const 5

Trinomial, D=4, L.C.=12

③ $(4x^2-5y^3)(4x^2+5y^3)$

$= 16x^4 + 20x^2y^3 - 20x^2y^3 - 25y^6$

$= \boxed{16x^4 - 25y^6}$

Binomial, Deg.6, L.C.=-25

④ $(x+2)(x-2)(x^2+4)$

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

$= x^4 - 16$

Const. -16

Binomial D=4 L.C. 1

Special Products:

① $(A+B)^2 = (A+B)(A+B)$

$= A^2 + AB + BA + B^2$

$\boxed{(A+B)^2 = A^2 + 2AB + B^2}$

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

$= \boxed{x^2 + 12x + 36}$

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

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

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

$= 16x^4 + 24x^2y^5 + 9y^{10}$

$16x^4$	$24x^2y^5$	$9y^{10}$
D=4	D=7	D=10
C=16	C=24	C=9

Deg. 10, L.C.9, Trinomial

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

$= 25x^6 + 20x^5 + 4x^4$ Trinomial, Deg.=6, L.C.=25, No Constant

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

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

$\boxed{(A-B)^2 = A^2 - 2AB + B^2}$

$(x - 9)^2 = (x)^2 - 2(x)(9) + (9)^2$

$= \boxed{x^2 - 18x + 81}$

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

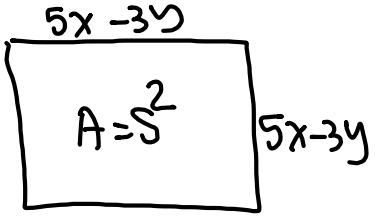
$= 4x^2 - 40x + 100$

$(7x^4 - 6)^2 = (7x^4)^2 - 2(7x^4)(6) + (6)^2$

$= 49x^8 - 84x^4 + 36$

$(3x^5 - 8x^2)^2 = (3x^5)^2 - 2(3x^5)(8x^2) + (8x^2)^2$

$= 9x^{10} - 48x^7 + 64x^4$



Find A

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

$= 25x^2 - 30xy + 9y^2$

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

Conjugates

$= A^2 - B^2$

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

$= \boxed{x^2 - 25}$

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

$= \boxed{9x^2 - 49}$

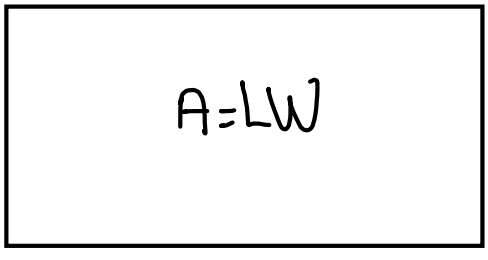
$(4x^3 + 10y^2)(4x^3 - 10y^2)$

Conjugates

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

$= 16x^6 - 100y^4$

Find the area



$4x^3y^2 - 5x^4y^3$

$4x^3y^2 + 5x^4y^3$

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

$= (4x^3y^2)^2 - (5x^4y^3)^2 = 16x^6y^4 - 25x^8y^6$

Polynomial / Monomial

$$\frac{10x^3 - 6x^2 + 4x}{2x} = \frac{\overset{5}{\cancel{10}}x^3}{\cancel{2}x} - \frac{\overset{3}{\cancel{6}}x^2}{\cancel{2}x} + \frac{\overset{2}{\cancel{4}}x}{\cancel{2}x}$$

$$= 5x^2 - 3x^1 + 2$$

$$= \boxed{5x^2 - 3x + 2}$$

$$\frac{28x^4y^3 - 14x^2y^2 + 7xy}{7xy} = \frac{28x^4y^3}{7xy} - \frac{14x^2y^2}{7xy} + \frac{7xy}{7xy}$$

$$= \boxed{4x^3y^2 - 2xy + 1}$$

$$\frac{50x^6y^5 - 10x^4y^3 + 5x^2y^2}{-5x^2y^2}$$

$$= \frac{50x^6y^5}{-5x^2y^2} - \frac{10x^4y^3}{-5x^2y^2} + \frac{5x^2y^2}{-5x^2y^2}$$

$$= \underbrace{-10x^4y^3}_{\substack{D=7 \\ C=-10}} + \underbrace{2x^2y}_{\substack{D=3 \\ C=2}} \underbrace{-1}_{\substack{\text{constant} \\ D=0}}$$

$D=7$, $L.C.=-10$, Trinomial

Polynomial

Binomial

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

Long Division

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

$x \boxed{-6} = -6x$

$x - 6$

$$
\begin{array}{r|l}
x + 1 & x - 6 \\
\hline
x^2 - 5x - 6 & \\
-(x^2 + x) & \\
\hline
-6x - 6 & \\
-(-6x - 6) & \\
\hline
0 & \text{Remainder}
\end{array}
$$

$\frac{2x^3 - 5x^2 + 7x - 1}{x - 1}$

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

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

$x \boxed{4} = 4x$

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

$$
\begin{array}{r|l}
x - 1 & 2x^2 - 3x + 4 \\
\hline
2x^3 - 5x^2 + 7x - 1 & \\
-(2x^3 - 2x^2) & \\
\hline
-3x^2 + 7x - 1 & \\
-(-3x^2 + 3x) & \\
\hline
4x - 1 & \\
-(4x - 4) & \\
\hline
3 & \text{Remainder}
\end{array}
$$

Recall

$\frac{26}{3}$

$3\overline{)26}$ 8 R 2

-24

$= 8\frac{2}{3}$

Rem.

Your turn:

$\frac{2x^2 - 5x + 8}{x - 2}$

$x - 2 \overline{)2x^2 - 5x + 8}$ Quotient: $2x - 1$

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

$-x + 8$

$-(-x + 2)$

6

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

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

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

$\frac{4x^3 - 5x^2 + 7x + 16}{x + 1}$

$x + 1 \overline{)4x^3 - 5x^2 + 7x + 16}$ Quotient: $4x^2 - 9x + 16$

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

$-9x^2 + 7x + 16$

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

$16x + 16$

$-(16x + 16)$

0

$x \boxed{4x^2} = 4x^3$

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

$x \boxed{16} = 16x$

$4x^2 - 9x + 16$

When we have missing terms:

$$\frac{x^2-30}{x-5} = \frac{x^2+0x-30}{x-5}$$

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

$x \boxed{5} = 5x$

$$\begin{array}{r} x+5 \\ x-5 \overline{)\, x^2+0x-30} \\ -(x^2-5x) \\ \hline 5x-30 \\ -(5x-25) \\ \hline \text{Rem. } -5 \end{array}$$

$x+5+\frac{-5}{x-5}$

Rem.

Always

$$\frac{2x^3-7x+4}{x+2} = \frac{2x^3+0x^2-7x+4}{x+2}$$

$$\begin{array}{r} 2x^2-4x+1 \\ x+2 \overline{)\, 2x^3+0x^2-7x+4} \\ -(2x^3+4x^2) \\ \hline -4x^2-7x+4 \\ -(-4x^2-8x) \\ \hline x+4 \\ -(x+2) \\ \hline 2 \end{array}$$

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

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

$x \boxed{1} = x$

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

Due Tuesday:

SG 13 & Those WP using system of linear equations

Expect a couple of Quizzes.