Math 115

Fall 2017

Lecture 18

$\sqrt{xy}$

Reduce

1) $\dfrac{\overset{3}{\cancel{24}}\; x^4\; y^{12}}{\underset{2}{\cancel{16}}\; x^9\; y^2} = \dfrac{3\; y^{10}}{2\; x^5}$

2) $\dfrac{-52\; x^{-6}\; y^{16}}{12\; x^2\; y^{-4}} = \dfrac{\overset{13}{\cancel{-52}}\; y^{16}\; y^4}{\underset{3}{\cancel{12}}\; x^2\; x^6} = \dfrac{-13\; y^{20}}{3\; x^8}$

3) $\dfrac{75\; x^{-8}\; y^2}{-24\; y^{-10}} = \dfrac{\overset{25}{\cancel{75}}\; y^2\; y^{10}}{\underset{8}{\cancel{-24}}\; x^8} = \dfrac{-25\; y^{12}}{8\; x^8}$

Simplify

$$\left(\frac{-2x^{-3}y^7}{3x^2y^4}\right)^3 = \left(\frac{-2 \quad y^7}{3 \; x^2x^3y^4}\right)^3$$

$$= \left(\frac{-2 \quad y^3}{3 \quad x^5}\right)^3 = \frac{(-2)^3(y^3)^3}{3^3(x^5)^3} = \boxed{\frac{-8 \; y^9}{27 \; x^{15}}}$$

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

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

Simplify $\left(\frac{-2x^{-5}}{5y^{-8}}\right)^{-2} = \left(\frac{-2 \; y^8}{5 \; x^5}\right)^{-2}$

$$= \left(\frac{5 \; x^5}{-2 \; y^8}\right)^2 = \frac{5^2(x^5)^2}{(-2)^2(y^8)^2} = \boxed{\frac{25 \; x^{10}}{4 \; y^{16}}}$$

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

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

$$= 9x^{10} + 6x^7 + x^4$$

Trinomial, $D=10$, L.C.$=9$, No constant.

$$(10x^3 + y^6)^2 = (10x^3)^2 + 2(10x^3)(y^6) + (y^6)^2$$

Trinomial
$D=12$
$LC=1$

$$= 100x^6 + 20x^3y^6 + y^{12}$$

$D=6$ $D=9$ $D=12$

No Constant.

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

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

$$= x^8 - 2x^7 + x^6$$

Trinomial, $D=8$, L.C.$=1$, No Constant

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

$$= 25x^{16} - 80x^{13} + 64x^{10}$$

Trinomial, $D=16$, L.C.$=25$, No Constant

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

$(12x^3 + 5)(12x^3 - 5) = (12x^3)^2 - (5)^2$

Conjugates.

$= 144x^6 - 25$

Binomial, $D = 6$, L.C. $= 144$, constant $= -25$

$(3x^2 - 11y^7)(3x^2 + 11y^7)$

Binomial
$D = 14$
L.C. $= -121$

$= (3x^2)^2 - (11y^7)^2 = 9x^4 - 121y^{14}$

Dividing Polynomial

I) Divide by **Monomial**

$$\frac{14x^3 - 49x^2}{7x} = \frac{14x^3}{7x} - \frac{49x^2}{7x}$$

$$= \boxed{2x^2 - 7x}$$

$$\frac{35x^8 - 25x^6 + 15x^4}{5x^2} = \frac{35x^8}{5x^2} - \frac{25x^6}{5x^2} + \frac{15x^4}{5x^2}$$

$$= \boxed{7x^6 - 5x^4 + 3x^2}$$

Divide

$$\frac{28x^{10} - 16x^7 + 4x^3}{-4x^3}$$

$$= \frac{28x^{10}}{-4x^3} - \frac{16x^7}{-4x^3} + \frac{4x^3}{-4x^3}$$

$$= -7x^7 + 4x^4 - 1$$

Trinomial
$D=7, \ L.C.=-7$
Const. -1

$$\frac{75x^5y^3 - 25x^2y^4 + 45xy^6}{-5xy^3}$$

$$= \frac{75x^5y^3}{-5xy^3} - \frac{25x^2y^4}{-5xy^3} + \frac{45xy^6}{-5xy^3}$$

$$= -15x^4 + 5xy - 9y^3$$

$D=4$ $\qquad$ $D=1+1=2$ $\qquad$ $D=3$

Trinomial, $D=4$, $L.C.-15$, NO Constant.

Long Division

$$\dfrac{\text{Polynomial}}{\text{Polynomial}}$$

$$\dfrac{x^2 + 5x + 6}{x+2}$$

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

$x \boxed{3} = 3x$

$\boxed{x + 3}$

$$
\begin{array}{r}
x +3 \\
x+2 \enclose{longdiv}{x^2 + 5x + 6} \\
-(x^2 + 2x) \\
\hline
3x + 6 \\
-(3x + 6) \\
\hline
\end{array}
$$

Remainder $\longrightarrow 0$

Divide: $\dfrac{2x^3 - 3x^2 + 5x - 4}{x - 1}$

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

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

$x \boxed{4} = 4x$

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

$$
\begin{array}{r}
2x^2 -x +4 \\
x-1 \enclose{longdiv}{2x^3 - 3x^2 + 5x - 4} \\
-(2x^3 - 2x^2) \\
\hline
-x^2 + 5x - 4 \\
-(-x^2 + x) \\
\hline
4x - 4 \\
-(4x - 4) \\
\hline
\end{array}
$$

Remainder $\longrightarrow 0$

Divide $\dfrac{x^3 + 4x^2 - 12}{x - 3}$ we have a missing term → $0x$

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

$x \boxed{7x} = 7x^2$

$x \boxed{21} = 21x$

$$
\begin{array}{r}
x^2 + 7x + 21 \\
x-3 \overline{) x^3 + 4x^2 + 0x - 12} \\
-(x^3 - 3x^2) \qquad\quad \\
\hline
7x^2 + 0x - 12 \\
-(7x^2 - 21x) \quad \\
\hline
21x - 12 \\
-(21x - 63) \\
\hline
\end{array}
$$

Always

$x^2 + 7x + 21 + \dfrac{51}{x-3}$

Remainder → 51

Divide: $\dfrac{-4x + 4x^2 - 5}{2x - 1} = \dfrac{4x^2 - 4x - 5}{2x - 1}$

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

$2x \boxed{-1} = -2x$

$$
\begin{array}{r}
2x - 1 \\
2x-1 \overline{) 4x^2 - 4x - 5} \\
-(4x^2 - 2x) \qquad \\
\hline
-2x - 5 \\
-(-2x + 1) \\
\hline
\end{array}
$$

Remainder → −6

Always

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

7

Divide: $\dfrac{30x^2 + 2 - 17x}{5x - 2}$

$5x \boxed{6x} = 30x^2$

$5x \boxed{-1} = -5x$

$\boxed{6x - 1}$

$$
\begin{array}{r}
6x \quad -1 \\
5x-2 \overline{\smash{)}\, 30x^2 - 17x + 2} \\
-(30x^2 - 12x \quad) \\
\hline
-5x \quad +2 \\
-(-5x \quad +2) \\
\hline
0
\end{array}
$$

$\dfrac{-13x - 11 + 4x^2}{4x + 3} = \dfrac{4x^2 - 13x - 11}{4x + 3}$

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

$4x \boxed{-4} = -16x$

Final Ans: $\boxed{x - 4 + \dfrac{1}{4x+3}}$ Always

$$
\begin{array}{r}
x \quad -4 \\
4x+3 \overline{\smash{)}\, 4x^2 - 13x - 11} \\
-(4x^2 + 3x \quad) \\
\hline
-16x - 11 \\
-(-16x - 12) \\
\hline
1
\end{array}
$$

$$\frac{3x^3 + 12 + 11x}{x+4} = \frac{3x^3 + 0x^2 + 11x + 12}{x+4}$$

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

$x \boxed{-12x} = -12x^2$

$x \boxed{59} = 59x$

$$\boxed{3x^2 - 12x + 59 + \frac{-224}{x+4}}$$

Always

$$\begin{array}{r} 3x^2 \quad -12x \quad +59 \\ x+4 \overline{\smash{\big)}\, 3x^3 + 0x^2 + 11x + 12} \\ \underline{-(3x^3 + 12x^2 \qquad\qquad)} \\ -12x^2 + 11x + 12 \\ \underline{-(-12x^2 - 48x \qquad)} \\ 59x + 12 \\ \underline{-(59x + 236)} \\ -224 \end{array}$$

$$\frac{x^3 - 8}{x-2} = \frac{x^3 + 0x^2 + 0x - 8}{x-2}$$

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

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

$x \boxed{4} = 4x$

$$x^2 + 2x + 4$$

$$\begin{array}{r} x^2 \quad +2x \quad +4 \\ x-2 \overline{\smash{\big)}\, x^3 + 0x^2 + 0x - 8} \\ \underline{-(x^3 - 2x^2 \qquad\qquad)} \\ 2x^2 + 0x - 8 \\ \underline{-(2x^2 - 4x \qquad)} \\ 4x - 8 \\ \underline{-(4x - 8)} \\ 0 \end{array}$$

9

$$\frac{x^4 - 13x^2 + 35}{x - 3}$$

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

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

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

$x\boxed{-12} = -12x$

$$x - 3 \enclose{longdiv}{x^4 + 0x^3 - 13x^2 + 0x + 35} \quad \frac{x^3 + 3x^2 - 4x - 12}{}$$

$-(x^4 - 3x^3 \qquad\qquad)$

$3x^3 - 13x^2 + 0x + 35$

$-(3x^3 - 9x^2 \qquad)$

$-4x^2 + 0x + 35$

$-(-4x^2 + 12x \quad)$

$-12x + 35$

$-(-12x + 36)$

-1

$$x^3 + 3x^2 - 4x - 12 + \frac{-1}{x-3}$$

$$\frac{4x^2 - 25}{2x + 5}$$

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

$2x\boxed{-5} = -10x$

$$2x + 5 \enclose{longdiv}{4x^2 + 0x - 25} \quad \frac{2x \qquad -5}{}$$

$-(4x^2 + 10x \qquad)$

$-10x - 25$

$-(-10x - 25)$

0

$$2x - 5$$

10

One SG Due everyday
next week

Project 2 due Tuesday.

Clear Your Calendar for next
week & next weekend