Math 115

Summer 2017

Lecture 12

Simplify

1) $(3.2\times10^{23})\cdot(4.5\times10^{-40})$

$= 14.4\times10^{-17} = 1.44\times10^{1}\times10^{-17} = \boxed{1.44\times10^{-16}}$

2) $(-4x^5)^3\cdot(-2x^7) = (-4)^3(x^5)^3\cdot(-2x^7)$

$= -64x^{15}\cdot(-2x^7)$

$= \boxed{128x^{22}}$

3) $\left(\frac{-2x^7y^{-3}}{3z^6}\right)^{-3} = \left(\frac{-2x^7}{3y^3z^6}\right)^{-3} = \left(\frac{3y^3z^6}{-2x^7}\right)^3$

$= \boxed{\frac{27y^9z^{18}}{-8x^{21}}} = \boxed{\frac{-27y^9z^{18}}{8x^{21}}}$

4) $(3x+5)^2 \quad (A+B)^2$

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

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

5) $\frac{(-5x^6)^4}{(25x^8)^2} = \frac{(-5)^4(x^6)^4}{25^2(x^8)^2} = \frac{625x^{24}}{625x^{16}} = \boxed{x^8}$

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

$= \boxed{16x^4 - 56x^2 + 49}$

(7) $\dfrac{12x^6 - 4x^3 + 8x}{-4x^2} = \dfrac{12x^6}{-4x^2} - \dfrac{4x^3}{-4x^2} + \dfrac{8x}{-4x^2}$

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

(8) $\dfrac{12x^3 - 5x^2 + x - 8}{x-1}$

$x \boxed{12x^2} = 12x^3$

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

$x \boxed{8} = 8x$

$\boxed{12x^2 + 7x + 8}$

$$\begin{array}{r} 12x^2 + 7x + 8 \\ x-1 \overline{)\,12x^3 - 5x^2 + x - 8} \\ -(12x^3 - 12x^2) \\ \hline 7x^2 + x - 8 \\ -(7x^2 - 7x) \\ \hline 8x - 8 \\ -(8x - 8) \\ \hline 0 \end{array}$$

(9) $(5x^3 - 3y^2)(5x^3 + 3y^2) = (5x^3)^2 - (3y^2)^2$

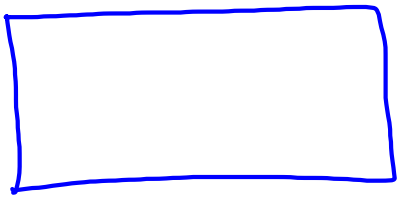
Conjugates

$= \boxed{25x^6 - 9y^4}$

(10) $\dfrac{8.2 \times 10^{18}}{4.1 \times 10^{30}} = 2 \times 10^{18-30}$

$= \boxed{2 \times 10^{-12}}$

(11)



$A = 15x^2 - 5x - 50$

$w = x - 2$

Find L

Hint $A = LW \Rightarrow L = \frac{A}{w}$

$$x-2 \overline{)\,15x^2 - 5x - 50}$$

$15x + 25$

$-(15x^2 - 30x)$

$25x - 50$

$-(25x - 50)$

0

$L = 15x + 25$

(12) Give Deg. & Coef. $-24x^6y$

$C = -24$, $D = 6+1 = 7$

(13) Distribute & Simplify

$$6x^2(-5x+4) - 10(x^3 + 5x^2 - 3x + 1) - 30x + 10$$

$= -30x^3 + 24x^2 - 10x^3 - 50x^2 + 30x - 10 - 30x + 10$

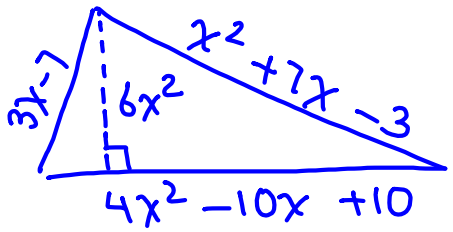
$= -40x^3 - 26x^2$ D=3, LC=-40

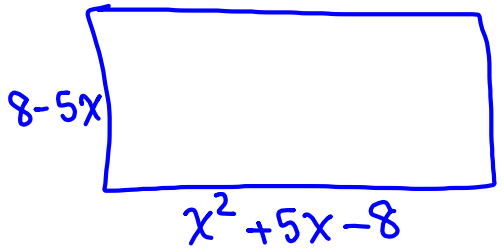
(14) Foil & Simplify: $(2x-5)(4x^2 + 10x + 25) + 100$

$= 8x^3 + 20x^2 + 50x - 20x^2 - 50x - 125 + 100$

$= 8x^3 - 25$ D=3, L.C.=8, Const. −25

Find A & P.





$P = 3x - 7 + 4x^2 - 10x + 10 + x^2 + 7x - 3$

$P = 5x^2$ Monomial $D=2,\ C=5$

$A = \frac{6x^2(4x^2 - 10x + 10)}{2}$

$A = 12x^4 - 30x^3 + 30x^2$

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

$P = 2x^2$ $D=2$ $C=2$

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

$= 8x^2 + 40x - 64 - 5x^3 - 25x^2 + 40x$

$A = -5x^3 - 17x^2 + 80x - 64$

Divide $\frac{6x^2 + 10x - 5}{3x-1}$

$3x \boxed{2x} = 6x^2$

$3x \boxed{4} = 12x$

$$\begin{array}{r} 2x + 4 \\ 3x-1 \overline{)\ 6x^2 + 10x - 5} \\ -(6x^2 - 2x\ \ \ \ \ ) \\ \hline 12x - 5 \\ -(12x - 4) \\ \hline -1 \end{array}$$

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

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

$x \cdot \square = 3x^3$

$x \cdot \square = -2x^2$

$x \cdot \square = -2x$

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

$$3x^2 - 2x - 2$$

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

$$-2x^2 + 0x + 2$$

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

$$-2x + 2$$

$$-(-2x + 2)$$

$$0$$

$3x^2 - 2x - 2$

Area of a rectangle is $4x^6 - 25$.

Width is $2x^3 - 5$. Find its length.

$2x^3 \cdot \square = 4x^6$

$2x^3 \cdot \square = 10x^3$

$L = 2x^3 + 5$

$$2x^3 - 5 \overline{)\,4x^6 - 25}$$

$$2x^3 + 5$$

$$-(4x^6 - 10x^3)$$

$$10x^3 - 25$$

$$-(10x^3 - 25)$$

$$0$$

$$\frac{4x^6 - 25}{2x^3 - 5}$$

$$\frac{8x-2}{2} = \frac{8x}{2} - \frac{2}{2} = 4x-1$$

$$\frac{8x-2}{2x} = \frac{8x}{2x} - \frac{2}{2x} = 4 - \frac{1}{x}$$

$\frac{3x+5}{5x-3}$ Long Div. (Divide by Polynomial other than monomial!)

Exam III : Monday @ 6:00 AM

Ch. 5 : Factoring Polynomial

Writing a Polynomial in product form of other Polynomial is called factoring.

$$10x - 15 = \boxed{5} \cdot 2x - \boxed{5} \cdot 3$$

$$= \boxed{5(2x-3)}$$

GCF

$$16x^3 + 12x^2 = \boxed{4x^2} \cdot 4x + \boxed{4x^2} \cdot 3$$

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

$7x(3x+5) - 6(3x+5)$

$= (3x+5)(7x-6)$

GCF

$25x^3y^2 - 10x^2y + 5xy$

$= \boxed{5xy(5x^2y - 2x + 1)}$

GCF

$2x^3 - 5x^2 + 10x - 25$

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

Grouping

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

$7x^3 + 3x^2 - 14x - 6$

$= x^2(7x+3) - 2(7x+3) = \boxed{(7x+3)(x^2-2)}$

Factoring Trinomials $ax^2 + bx + c$

$x^2 + 10x + 24$ $= x^2 + 4x + 6x + 24$

$P = 24$

$S = 10$

24

1, 24
2, 12
3, 8
4, 6

$= x(x+4) + 6(x+4)$

$= (x+4)(x+6)$

$x^2 + x - 12$ $= x^2 - 3x + 4x - 12$

$P = -12$

$S = 1$

-12

$-1, 12$
$-2, 6$
$-3, 4$

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

$= \boxed{(x-3)(x+4)}$

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

$P = -10$

$S = -3$

-10

1, -10
2, -5

$= 2x(x+1) - 5(x+1)$

$= (x+1)(2x-5)$

$4x^2 + 5x - 9$ $= 4x^2 + 9x - 4x - 9$

$P = -36$

$S = 5$

-36

$-1, 36$
$-2, 18$
$-3, 12$
$-4, 9$
$-6, 6$

$= x(4x+9) - 1(4x+9)$

$= \boxed{(4x+9)(x-1)}$

Special Factoring: Two Terms

$A^2 + B^2 = \text{Prime}$

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

$A^3 + B^3$

$A^3 - B^3$

$x^2 + 36 = x^2 + 6^2$ Prime

$x^2 - 36 = x^2 - 6^2 = (x+6)(x-6)$

$4x^2 + 49 = (2x)^2 + 7^2 \Rightarrow$ Prime

$4x^2 - 49 = (2x)^2 - 7^2 = (2x+7)(2x-7)$

$25x^2 + 64 = (5x)^2 + 8^2$ Prime

$25x^2 - 64 = (5x)^2 - 8^2 = (5x+8)(5x-8)$

Special Factoring: Two Terms

$A^2 + B^2 = \text{Prime}$

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

$A^3 + B^3 = (A+B)(A^2 - AB + B^2)$

$A^3 - B^3$

$x^3 + 125 = x^3 + 5^3$

$= (x+5)(x^2 - 5x + 25)$

$27x^3 + 64 = (3x)^3 + (4)^3$

$= (3x+4)(9x^2 - 12x + 16)$

$8x^3 + 27y^3 = (2x)^3 + (3y)^3$

$= (2x+3y)(4x^2 - 6xy + 9y^2)$

Special Factoring: Two Terms

$A^2 + B^2 = \text{Prime}$

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

$A^3 + B^3 = (A+B)(A^2 - AB + B^2)$

$A^3 - B^3 = (A-B)(A^2 + AB + B^2)$

$125x^3 - 8 = (5x)^3 - (2)^3$

$= (5x-2)(25x^2 + 10x + 4)$

$1000x^3 - 27y^3 = (10x)^3 - (3y)^3$

$= (10x-3y)(100x^2 + 30xy + 9y^2)$

Special factoring: Perfect-Square trinomials

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

$$x^2 + 16x + 64 = (x + 8)^2$$

$2(x)(8)$

$$25x^2 + 70x + 49 = (5x + 7)^2$$

$2(5x)(7)$

$$36x^2 + 60xy + 25y^2 = (6x + 5y)^2$$

$2(6x)(5y)$

$$49x^4 + 140x^2y^3 + 100y^6 = (7x^2 + 10y^3)^2$$

$2(7x^2)(10y^3)$

Special Factoring: Perfect-Square trinomials

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

$x^2 - 24x + 144 = (x - 12)^2$

$25x^2 - 60xy^5 + 36y^{10} = (5x - 6y^5)^2$

$x^2 - 13x + 36 = ~~(x - 6)^2~~$

36

P = 36
S = −13

$= (x - 9)(x - 4)$