

Math 115

Fall 2018

Lecture 19

$$? a^2 + b^2 = c^2 ?$$

$$y = mx + b \quad ? \quad d = rt$$

Feb 19-8:47 AM

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

$$1) (2x + 7)^2 = (2x)^2 + 2(2x)(7) + (7)^2$$

$$= 4x^2 + 28x + 49$$

Trinomial
D=2, L.C.=4
Const=49

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

$$= x^8 + 6x^6 + 9x^4$$

Trinomial
D=8, L.C.=1
No constant

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

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

Trinomial
D=10, L.C.=1
No constant

Nov 26-6:01 AM

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

$$1) (x-8)^2 = (x)^2 - 2(x)(8) + (8)^2$$

$$= x^2 - 16x + 64$$

Trinomial
D=2, L.C.=1
Const.=64

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

$$= 16x^6 - 40x^4 + 25x^2$$

Trinomial, D=6, L.C.=16
No constant

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

$$= 100x^{12} - 60x^6y^3 + 9y^6$$

D=12
L.C.=100

D=12
C=100

D=6+3=9
C=-60

D=6
C=9

Nov 26-6:10 AM

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

Conjugates

Difference of two Squares.

$$① (x+5)(x-5)$$

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

Binomial
D=2, L.C.=1,
Const.=-25

$$② (3x^2+7)(3x^2-7)$$

$$= (3x^2)^2 - (7)^2 = 9x^4 - 49$$

Binomial
D=4, L.C.=9
Const.=-49

$$③ (9x^6 - 8x^3)(9x^6 + 8x^3)$$

$$= (9x^6)^2 - (8x^3)^2$$

$$= 81x^{12} - 64x^6$$

Binomial, D=12, L.C.=81
No constant.

Nov 26-6:21 AM

Division by **monomial**:

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

$$= \frac{\cancel{24}x^5}{\cancel{4}x} - \frac{\cancel{16}x^3}{\cancel{4}x} + \frac{\cancel{8}x^2}{\cancel{4}x} = 6x^{5-1} - x^{3-1} + 2x^{2-1}$$

$$= 6x^4 - x^2 + 2x^1$$

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

$$T, D=4, LC=6$$

Nov 26-6:29 AM

Divide & Simplify

$$\textcircled{1} \frac{49x^8 - 14x^5}{-7x^3} = \frac{\cancel{49}x^8}{\cancel{-7}x^3} - \frac{\cancel{14}x^5}{\cancel{-7}x^3}$$

Binomial
D=5,
L.C.=-7

$$= -7x^{8-3} + 2x^{5-3} = \boxed{-7x^5 + 2x^2}$$

$$\textcircled{2} \frac{50x^7y^3 + 25x^5y^2 - 5x^2y}{-5x^2y}$$

$$= \frac{50x^7y^3}{-5x^2y} + \frac{25x^5y^2}{-5x^2y} - \frac{5x^2y}{-5x^2y}$$

$$= -10x^5y^2 - 5x^3y + 1$$

$$D=5+2=7$$

$$C=-10$$

$$D=3+1=4$$

$$C=-5$$

$$\text{Constant}$$

$$D=0$$

Trinomial
D=7
L.C.=-10
Const.=1

Nov 26-6:32 AM

Divide using long division:

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

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

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

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

Always

Remainder $\rightarrow 1$

$$\begin{array}{r} 2x \quad -1 \\ x-2 \overline{) 2x^2 - 5x + 3} \\ \underline{-(2x^2 - 4x)} \\ -x + 3 \\ \underline{-(-x + 2)} \\ 1 \end{array}$$

Nov 26-6:44 AM

Divide by long division:

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

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

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

$$x \boxed{14} = 14x$$

$$2x^2 - 7x + 14 + \frac{-17}{x+1}$$

Always

Rem. $\rightarrow -17$

$$\begin{array}{r} 2x^2 \quad -7x \quad +14 \\ x+1 \overline{) 2x^3 - 5x^2 + 7x - 3} \\ \underline{-(2x^3 + 2x^2)} \\ -7x^2 + 7x - 3 \\ \underline{-(-7x^2 - 7x)} \\ 14x - 3 \\ \underline{-(14x + 14)} \\ -17 \end{array}$$

Nov 26-6:49 AM

Divide using long division

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

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

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

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

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

$$\begin{array}{r} 4x^2 + 4x - 1 \\ x-1 \overline{) 4x^3 + 0x^2 - 5x + 1} \\ \underline{-(4x^3 - 4x^2 + 1)} \\ 4x^2 - 5x + 1 \\ \underline{-(4x^2 - 4x)} \\ -x + 1 \\ \underline{-(-x + 1)} \\ \text{Rem} \rightarrow 0 \end{array}$$

Nov 26-6:59 AM

Simplify:

$$\textcircled{1} (-5x^4y^3)^3$$

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

$$= \boxed{-125x^{12}y^9}$$

Monomial

D=21, C=-125

$$\textcircled{2} \left(\frac{2x^6}{3y^5} \right)^4$$

$$= \frac{2^4 (x^6)^4}{3^4 (y^5)^4}$$

$$= \boxed{\frac{16x^{24}}{81y^{20}}}$$

Not a Monomial

$$\textcircled{3} (5x - 3)(25x^2 + 15x + 9)$$

$$= 125x^3 + 75x^2 + 45x - 75x^2 - 45x - 27$$

$$= \boxed{125x^3 - 27}$$

Binomial

D=3, LC=125, Const=-27

It is a term.

Nov 26-7:04 AM

Simplify

$$\textcircled{1} (2.5 \times 10^{18})(4.1 \times 10^{11})$$

$$= 10.25 \times 10^{29} = 1.025 \times 10^1 \times 10^{29}$$

has to be $1 < < 10$

$$= 1.025 \times 10^{30}$$

$$\textcircled{2} \frac{3.5 \times 10^{-12}}{1.75 \times 10^{-7}}$$

$$= 2 \times 10^{-12-7} = 2 \times 10^{-19}$$

Nov 26-7:12 AM

Simplify

$$\left(1.2 \times 10^{-23}\right) \cdot \left(4 \times 10^{-17}\right) = 4.8 \times 10^{-23+(-17)}$$

$$= 4.8 \times 10^{-40}$$

$$\frac{1.25 \times 10^{15}}{5 \times 10^{-10}} = .25 \times 10^{15-(-10)}$$

$$= .25 \times 10^{25}$$

It has to
be $1 < < 10$

$$= 2.5 \times 10^{-1} \times 10^{25}$$

$$= 2.5 \times 10^{24}$$

Nov 26-7:16 AM

Divide

$$\frac{5x + 4x^3 - 8 - 4x^2}{2x - 1}$$

$$-1 + 2x$$

$$= \frac{4x^3 - 4x^2 + 5x - 8}{2x - 1}$$

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

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

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

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

Rem.

$$\begin{array}{r} 2x^2 \quad -x \quad +2 \\ 2x-1 \overline{) 4x^3 - 4x^2 + 5x - 8} \\ \underline{-(4x^3 - 2x^2 \quad \downarrow \quad \downarrow)} \\ -2x^2 + 5x - 8 \\ \underline{-(-2x^2 + x \quad \downarrow)} \\ 4x - 8 \\ \underline{-(4x - 2)} \\ -6 \end{array}$$

Nov 26-8:15 AM

Divide:

$$\frac{3 - x - 10x^2 + 8x^3}{2x + 1}$$

$$2x + 1$$

$$2x \boxed{4x^2} = 8x^3$$

$$2x \boxed{-7x} = -14x^2$$

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

$$4x^2 - 7x + 3$$

$$\begin{array}{r} 4x^2 \quad -7x \quad +3 \\ 2x+1 \overline{) 8x^3 - 10x^2 - x + 3} \\ \underline{-(8x^3 + 4x^2 \quad \downarrow \quad \downarrow)} \\ -14x^2 - x + 3 \\ \underline{-(-14x^2 - 7x \quad \downarrow)} \\ 6x + 3 \\ \underline{-(6x + 3)} \\ 0 \end{array}$$

Nov 26-8:21 AM

Divide

$$\begin{array}{r} 3x^3 + x + 5 \\ \hline x + 1 \end{array}$$

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

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

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

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

Rem. $\rightarrow 1$

$$\begin{array}{r} 3x^2 - 3x + 4 \\ x+1 \overline{) 3x^3 + 0x^2 + x + 5} \\ \underline{-(3x^3 + 3x^2)} \\ -3x^2 + x + 5 \\ \underline{-(-3x^2 - 3x)} \\ 4x + 5 \\ \underline{-(4x + 4)} \\ 1 \end{array}$$

Nov 26-8:27 AM

39 Coins total

Total Value \$7.50

Quarters & Dimes only.

How many of each?

use system of linear equations.

 $x \rightarrow$ Dimes $y \rightarrow$ Quarters

$$\begin{cases} x + y = 39 \\ 10x + 25y = 750 \end{cases}$$

$$\begin{cases} x + y = 39 \\ 2x + 5y = 150 \end{cases}$$

$$\begin{cases} -2x - 2y = -78 \\ 2x + 5y = 150 \end{cases}$$

$$\begin{array}{r} -2x - 2y = -78 \\ 2x + 5y = 150 \\ \hline 3y = 72 \end{array}$$

$$3y = 72$$

$$\rightarrow y = 24$$

24 Quarters

15 Dimes

Nov 26-8:33 AM

56 Stamps.

Total cost \$19.44.

Some 39¢ each,

some 24¢ each.

No other type.

How many of each? $\div 3$

$x \rightarrow \# \text{ of } 39¢ \text{ Stamps}$

$y \rightarrow \# \text{ of } 24¢ \text{ Stamps}$

$$\begin{cases} x + y = 56 \end{cases}$$

$$\begin{cases} 39x + 24y = 1944 \end{cases}$$

Divisible by 3

$$\begin{cases} -8x + y = 56 \end{cases}$$

$$\begin{cases} 13x + 8y = 648 \end{cases}$$

$$\begin{cases} -8x - 8y = -448 \end{cases}$$

$$\begin{cases} 13x + 8y = 648 \end{cases}$$

$$\begin{array}{r} 5x \\ \hline = 200 \end{array}$$

$$x = 40$$

40 stamps at 39¢ each

16 " " 24¢ "

Nov 26-8:40 AM

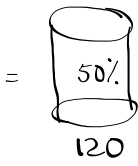
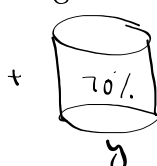
we need 120 liters of

50% alcohol soln.

we have unlimited supply

of 40% & 70% Solutions.

How many liters of each?



$$\begin{cases} x + y = 120 \\ 40\%x + 70\%y = 50\% \cdot 120 \end{cases}$$

$$\begin{cases} x + y = 120 \\ \div 10 \quad 40x + 70y = 50(120) \end{cases}$$

$$\begin{cases} -4x + y = 120 \\ 4x + 7y = 600 \end{cases}$$

$$\begin{cases} -4x - 4y = -480 \end{cases}$$

$$\begin{cases} 4x + 7y = 600 \end{cases}$$

$$\begin{array}{r} 3y = 120 \end{array}$$

$$\rightarrow y = 40$$

40 L of 70% Soln

&

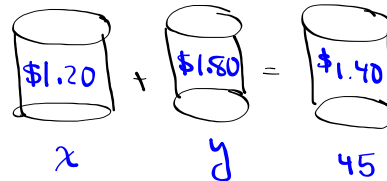
80 L of 40% Soln.

Nov 26-8:47 AM

We need 45 lb. of
\$1.40/lb. of Candy.

Store has \$1.20/lb
and \$1.80/lb.

How many pounds of
each?



$$\begin{cases} x + y = 45 \\ 1.20x + 1.80y = 1.40(45) \end{cases}$$

$$\begin{cases} x + y = 45 \\ 1.2x + 1.8y = 1.4(45) \end{cases} \Rightarrow \begin{cases} x + y = 45 \\ 12x + 18y = 14(45) \end{cases}$$

Divisible by 6

$$\begin{cases} x + y = 45 \\ 2x + 3y = 105 \end{cases} \Rightarrow \begin{cases} -2x - 2y = -90 \\ 2x + 3y = 105 \end{cases}$$

$$y = 15$$

15 lb. of \$1.80 Candy
30 lb. of \$1.20 Candy

Nov 26-8:55 AM

Exam III: Next Thursday

Final Exam: Dec. 13th

We have lectures during final week

work on SG 12, 13, and 14.

Nov 26-9:03 AM