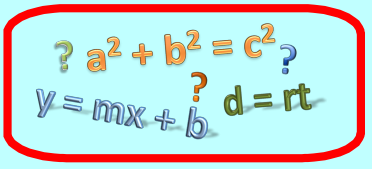
Math 115

Fall 2018

Lecture 20



Feb 19-8:47 AM

Ch. 5 : Factoring

Factoring is when we rewrite a Polynomial as a product (factor) of non-factorable polynomial.

ex: $20 = 2 \cdot 2 \cdot 5$

Monomial — Factors

ex: $14x^3 = 2 \cdot 7 \cdot x \cdot x \cdot x$

ex: $15x^2y^4 = 3 \cdot 5 \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y$

Nov 27-6:01 AM

GCF : Greatest Common Factor

ex: $15x + 10 = 3 \cdot 5 \cdot x + 2 \cdot 5$

Binomial

$= 5(3x + 2)$

To verify → Distribute

$= 5 \cdot 3x + 5 \cdot 2 = 15x + 10$ ✓

ex: $8x^2 - 12x = 4 \cdot 2 \cdot x \cdot x - 4 \cdot 3 \cdot x$

$= 4x(2x - 3)$

↳ GCF

Nov 27-6:05 AM

Factor out the GCF:

$25x^2y - 10xy$

$= 5 \cdot 5 \cdot x \cdot x \cdot y - 2 \cdot 5 \cdot x \cdot y$

$= 5xy(5x - 2)$

GCF

$36x^3 - 12x^2 + 6x$

$= 6x \cdot 6x^2 - 6x \cdot 2x + 6x \cdot 1$

$= 6x(6x^2 - 2x + 1)$

$5x(3x - 7) - 8(3x - 7)$

$= (3x - 7)(5x - 8)$

Nov 27-6:10 AM

Factor out the GCF:

① $10x + 20$

$= 10(x + 2)$

② $21x^2 - 7x$

$= 7x(3x - 1)$

③ $30x^3 - 40x^2 + 50x$

$= 10x(3x^2 - 4x + 5)$

④ $17x^2(x-1) - 8x(x-1) + 5(x-1)$

$= (x-1)(17x^2 - 8x + 5)$

Nov 27-6:16 AM

Factoring Polynomial with at least 4 terms by grouping:

$2x^3 + 5x^2 + 6x + 15$

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

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

To verify, we foil

$= 2x^3 + 6x + 5x^2 + 15$

$= 2x^3 + 5x^2 + 6x + 15$

Nov 27-6:25 AM

Factor by grouping:

$3x^3 - 4x^2 + 30x - 40$

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

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

$7x^3 + 15x^2 + 7x + 15$

$= x^2(7x + 15) + 1(7x + 15) = (7x + 15)(x^2 + 1)$

Nov 27-6:29 AM

Factor by grouping:

$x^3 - 5x^2 - 3x + 15$

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

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

Nov 27-6:39 AM

Factoring Trinomial in the form of $ax^2 + bx + c$:

Factor $x^2 + 8x + 15$

Two numbers

$P = 15$, $S = 8$

$1, 15$

$3, 5$

$= x^2 + 3x + 5x + 15$

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

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

Nov 27-6:43 AM

Factor $x^2 + 18x - 40$

Two numbers

$P = -40$, $S = 18$

$-1, 40$

$-2, 20$

$-4, 10$

$-5, 8$

$= x^2 - 2x + 20x - 40$

$= x(x-2) + 20(x-2)$

$= (x-2)(x+20)$

Nov 27-6:48 AM

Factor: $3x^2 - 7x - 10$

Two numbers

$P=-30$, $S=-7$

-30

$1, -30$

$2, -15$

$3, -10$

$5, -6$

$= 3x^2 + 3x - 10x - 10$

$= 3x(x+1) - 10(x+1)$

$= (x+1)(3x-10)$

Nov 27-6:54 AM

Use exponential rules to simplify

① $(-4x^5)^3$ $D=15, C=-64$

$= (-4)^3 (x^5)^3 = -64x^{15}$

② $\left(\frac{x^6}{2y^3}\right)^5 = \frac{x^{30}}{32y^{15}}$

③ $(x^{-4})^5 \cdot (x^4)^{-5}$

$= x^{-20} \cdot x^{-20}$

$= x^{-40} = \frac{1}{x^{40}}$

④ $\frac{16x^7y^{-8}}{24x^{-5}y^6}$

$= \frac{2x^7x^5}{3y^8y^6}$

$= \frac{2x^{12}}{3y^{14}}$

Nov 27-7:01 AM

Use special products to find

① $(2x+9)^2$

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

$=\boxed{4x^2+36x+81}$

② $(3x^2-y^5)^2$

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

$=\boxed{9x^4-6x^2y^5+y^{10}}$

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

Conjugates

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

Nov 27-7:10 AM

Divide:

① $\dfrac{45x^6-9x^4+3x^2}{3x^2}=\dfrac{\overset{15}{\cancel{45}}x^6}{\cancel{3}x^2}-\dfrac{\overset{3}{\cancel{9}}x^4}{\cancel{3}x^2}+\dfrac{3x^2}{3x^2}$

$=\boxed{15x^4-3x^2+1}$

② $\dfrac{2x^3-5x^2+7x-1}{x-2}$

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

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

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

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

$$2x^2-x+5$$

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

$-x^2+7x-1$

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

$5x-1$

$-(5x-10)$

9

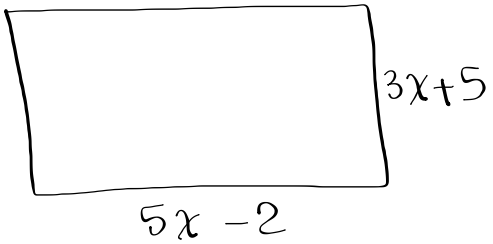
$2x^2-x+5+\dfrac{9}{x-2}$

Nov 27-7:17 AM

Find area & Perimeter

$A = LW$

$P = 2L + 2W$



$P = 2L + 2W$

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

$= 10x - 4 + 6x + 10$

$= \boxed{16x + 6}$

$A = LW$

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

$= 15x^2 + 25x - 6x - 10$

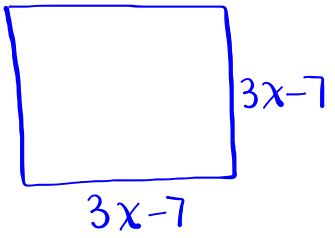
$= \boxed{15x^2 + 19x - 10}$

Nov 27-7:58 AM

Find the area & Perimeter

$A = S^2$

$P = 4S$



$P = 4S$

$= 4(3x-7)$

$= \boxed{12x - 28}$

$A = S^2$

$= (3x-7)^2$

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

$= \boxed{9x^2 - 42x + 49}$

Nov 27-8:02 AM

Simplify:

① $(7.2 \times 10^{-13}) \cdot (5 \times 10^{5})$

$= 36 \times 10^{-8} = 3.6 \times 10^{1} \times 10^{-8} = \boxed{3.6 \times 10^{-7}}$

② $\dfrac{6.5 \times 10^{18}}{3.25 \times 10^{-6}} = 2 \times 10^{18-(-6)}$

$= \boxed{2 \times 10^{24}}$

Nov 27-8:06 AM

Simplify:

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

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

$= (x+4)(x^2+8x+16)$

$= x^3 + 8x^2 + 16x + 4x^2 + 32x + 64$

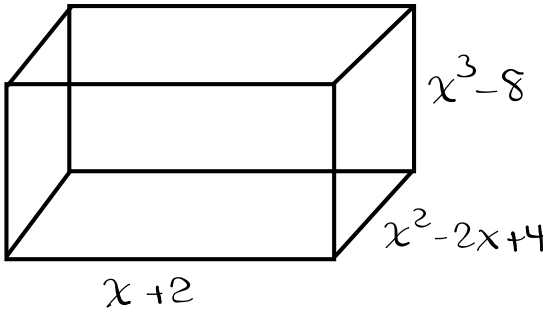
$= \boxed{x^3 + 12x^2 + 48x + 64}$

Polynomial, D=3, L.C.=1, Const.=64

Nov 27-8:12 AM

Find the volume

$V = LWH$



$V=(x+2)(x^2-2x+4)(x^3-8)$

foil, simplify

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

Conjugates

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

$=\boxed{x^6-64}$

Nov 27-8:17 AM

Multiply the following by their Conjugates:

① $(3x+5)(3x-5)=(3x)^2-(5)^2=\boxed{9x^2-25}$

② $(4x^3-7x^2)(4x^3+7x^2)=(4x^3)^2-(7x^2)^2$

$=\boxed{16x^6-49x^4}$

③ $(6x^{10}+8y^4)(6x^{10}-8y^4)$

$=(6x^{10})^2-(8y^4)^2=\boxed{36x^{20}-64y^8}$

Nov 27-8:21 AM

Divide: $\dfrac{4x^3 - 5x^2 - 7}{x+3}$

$$x+3 \;\overline{)\; 4x^3 - 5x^2 + 0x - 7}$$

$4x^2 - 17x + 51$

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

$-(4x^3 + 12x^2)$

$-17x^2 + 0x - 7$

$x \cdot (-17x) = -17x^2$

$-(-17x^2 - 51x)$

$51x - 7$

$x \cdot 51 = 51x$

$-(51x + 153)$

Always

-160

$$4x^2 - 17x + 51 + \frac{-160}{x+3}$$

Nov 27-8:27 AM

Simplify

① $x^{\frac{3}{5}} \cdot x^{\frac{1}{4}}$

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

$= x^{\frac{3 \cdot 4 + 1 \cdot 5}{20}}$

$= \boxed{x^{\frac{17}{20}}}$

② $\dfrac{x^{5/6}}{x^{1/3}}$

$= x^{\frac{5}{6} - \frac{1}{3}}$

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

$= x^{\frac{3}{6}} = \boxed{x^{\frac{1}{2}}}$

Nov 27-8:34 AM

Simplify:

① $2^{-1} - 4^{-1}$

$= \frac{1}{2^1} - \frac{1}{4^1} = \frac{1}{2} - \frac{1}{4} = \frac{2-1}{4}$

$= \boxed{1/4}$

② $(3x^{-2})^4$

$= 3^4 \cdot (x^{-2})^4$

$= 81\, x^{-8} = \boxed{\frac{81}{x^8}}$

③ Subtract: $3x^2 - 5x + 6$

$-\ (x^2 + 8x - 4)$

$\boxed{2x^2 - 13x + 10}$

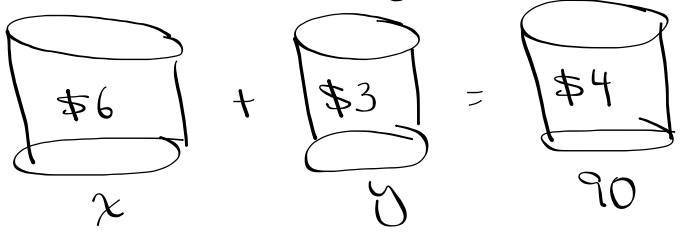
Trinomial

D=2, L.C.=2, Const. =10

Nov 27-8:39 AM

we need 90 pounds of mix coffee worth $4/lb.

We can mix two different brand of coffee, one sells @ $6/lb., and the other one @ $3/lb. How many pounds of each?

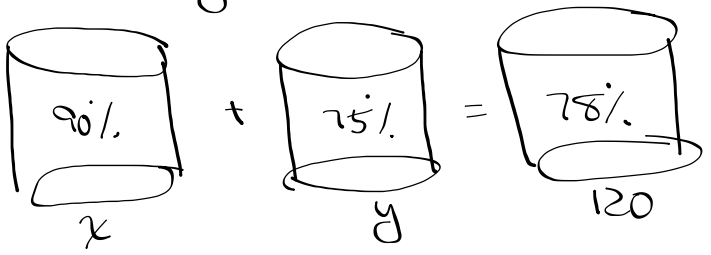


$$\begin{cases} x + y = 90 \\ 6x + 3y = 4 \cdot 90 \end{cases}$$

⇒ Make Sure to finish it.

Nov 27-8:46 AM

we need 120 liters of 78% alcohol soln.
we have unlimited supply of 90% & 75% alcohol solns.
How many liters of each?



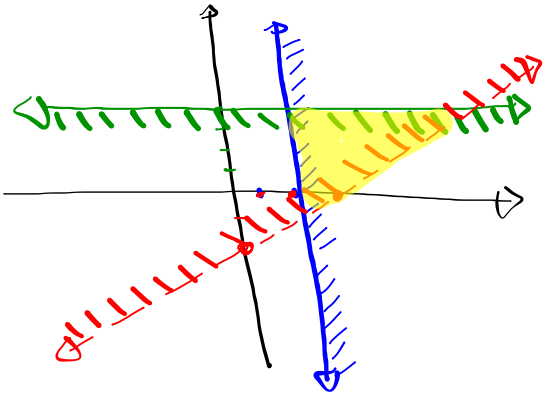
$$\begin{cases} x + y = 120 \\ .90x + .75y = .78(120) \end{cases}$$

Make Sure to Solve this.

Nov 27-8:53 AM

Graph & shade the soln.

$$\begin{cases} x \geq 2 \\ y \leq 4 \\ y > \frac{2}{3}x - 2 \end{cases}$$



Nov 27-8:58 AM

Class QZ, Box Final Ans.

SG 12, 13, 14
Due Thurs.

① Simplify: $(-5x^3)^3 = (-5)^3(x^3)^3 = \boxed{-125x^9}$

② Simplify: $(5x-7)(5x+7) = (5x)^2 - (7)^2$

$= \boxed{25x^2 - 49}$

③ Divide: $\frac{3x^2-5x-8}{x-1}$

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

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

$$\begin{array}{r|l} & 3x \quad -2 \\ \hline x-1 & 3x^2 - 5x - 8 \\ & -(3x^2 - 3x\ \ ) \\ \hline & -2x - 8 \\ & -(-2x + 2) \\ \hline & -10 \end{array}$$

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

Nov 27-9:04 AM