Math 115

Spring 2017

Lecture 21

① Simplify: $(-4x^5y^2)^3 = (-4)^3(x^5)^3(y^2)^3$ D=21

$= \boxed{-64x^{15}y^6}$ C=-64

② Simplify: $\left(\frac{-2x^{-4}}{y^{-6}}\right)^{-4} = \left(\frac{-2y^6}{x^4}\right)^{-4} = \left(\frac{x^4}{-2y^6}\right)^4 = \boxed{\frac{x^{16}}{16y^{24}}}$

③ Simplify: $(2x-5)^2 + 20x$

$= (2x)^2 - 2(2x)(5) + (5)^2 + 20x$

$= 4x^2 - 20x + 25 + 20x$

$= \boxed{4x^2 + 25}$

④ Multiply $3x^4+2y^6$ by its conjugate

$(3x^4+2y^6)(3x^4-2y^6) = (3x^4)^2-(2y^6)^2 = \boxed{9x^8-4y^{12}}$

⑤ Divide: $\dfrac{30x^6-20x^4+10x^2}{-10x^2} = \dfrac{30x^6}{-10x^2}-\dfrac{20x^4}{-10x^2}+\dfrac{10x^2}{-10x^2}$

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

Trinomial

Deg. = 4

L.C. = -3

Const = -1

⑥ Divide: $\dfrac{3x^2+17x-7}{3x+2}$

$$\begin{array}{r} x+5 \\ 3x+2 \overline{)\,3x^2+17x-7} \\ -(3x^2+2x) \\ \hline 15x-7 \\ -(15x+10) \\ \hline -17 \end{array}$$

$x+5+\dfrac{-17}{3x+2}$

⑦ Simplify: $(-7x^8)\cdot(5x^3) = -35x^8x^3 = \boxed{-35x^{11}}$

⑧ Simplify: $\dfrac{-28x^7y^{10}}{4x^2y^{15}} = \boxed{\dfrac{-7x^5}{y^5}}$

⑨ Simplify: $(1.25\times10^{17})\cdot(4.8\times10^{-28})$

$= 6\times10^{17+(-28)} = \boxed{6\times10^{-11}}$

⑩ Simplify: $\dfrac{8.5\times10^{-13}}{4.25\times10^{17}} = 2\times10^{-13-17} = \boxed{2\times10^{-30}}$

Factor Completely:

① $3x^2 - 75$

$= 3(x^2 - 25)$

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

② $2x^3 - 98x$

$= 2x(x^2 - 49)$

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

③ $x^2 + 4x + 3$

$= \boxed{(x+1)(x+3)}$

1x, 3x

④ $7x^2 + 19x - 6$

$P = -42$, $S = 19$

$-1, 42$; $\boxed{-2, 21}$; $-3, 14$; $-6, 7$

$= 7x^2 - 2x + 21x - 6$

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

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

⑤ $x^3 + 2x^2 - 15x$

$= x(x^2 + 2x - 15)$

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

⑥ $6y^2 + y - 15$

$P = -90$, $S = 1$

$-9, 10$

$= 6y^2 - 9y + 10y - 15$

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

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

⑦ $x^4 - 8x$

$= x(x^3 - 8)$

$x^3 - 2^3$

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

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

⑧ $8y^5 + 125y^2$

$= y^2(8y^3 + 125)$

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

$= \boxed{y^2(2y+5)(4y^2 - 10y + 25)}$

(9) $x^3 + 7x^2 - 4x - 28$

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

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

(10) $25x^2 - 80xy + 64y^2$

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

$2(5x)(8y) = 80xy$

(11) $x^2 + 13x + 36 = (x+9)(x+4)$

$(x \quad 6)^2$

$2(x)(6) = 12x$

(12) $36x^2 + 25$

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

(14) $3x^2 - 5x + 1$

Prime

Zero-Product Rule:

If $A \cdot B = 0$, then $A = 0$ or $B = 0$ (Maybe both)

Ex: Solve

$$\underbrace{(x-5)}_{A}\underbrace{(x+3)}_{B} = 0$$

$x - 5 = 0$ or $x + 3 = 0$

$\boxed{x = 5}$ or $\boxed{x = -3}$ $\Rightarrow \{-3, 5\}$

Solve

$(2x-7)(3x+10) = 0$

By Zero-Product Rule

$2x - 7 = 0$ or $3x + 10 = 0$

$2x = 7$ $\qquad$ $3x = -10$

$\boxed{x = \frac{7}{2}}$ or $\boxed{x = \frac{-10}{3}}$ $\Rightarrow \left\{\frac{-10}{3}, \frac{7}{2}\right\}$

Solve $-4x(x-10)(10x+1) = 0$

By Z.P.R.

$-4x = 0$ or $x - 10 = 0$ or $10x + 1 = 0$

$x = \frac{0}{-4}$ $\qquad$ $10x = -1$

$\boxed{x = 0}$ $\qquad$ $\boxed{x = 10}$ $\qquad$ $\boxed{x = -1/10}$ $\qquad$ $\left\{\frac{-1}{10}, 0, 10\right\}$

Solving Polynomial Equations:

1. Make one side = 0
2. Factor the other side Completely
3. Use Zero-Product Rule, and solve each factor
4. Solns in a Soln Set

$x^2 - 36 = 5x$

$x^2 - 36 - 5x = 0$

$x^2 - 5x - 36 = 0$

$(x-9)(x+4) = 0$

By Z.P.R.

$x-9=0$ or $x+4=0$

$\boxed{x=9}$ $\boxed{x=-4}$

$\{-4, 9\}$

Solve $4x^2 - 11x = 3$

$4x^2 - 11x - 3 = 0$

$P = -12$

$S = -11$

$1 \& -12$

$4x^2 + x - 12x - 3 = 0$

$x(4x+1) - 3(4x+1) = 0$

$(4x+1)(x-3) = 0$

by Z.P.R.

$4x+1=0$ or $x-3=0$

$\boxed{x=-\frac{1}{4}}$ $\boxed{x=3}$

$\left\{-\frac{1}{4}, 3\right\}$

The product of two consecutive integers is 30. Find all such integers.

x & $x+1$

$x(x+1)=30$

$x^2+x=30$

$x^2+x-30=0$

$(x+6)(x-5)=0$

By Z.P.R.

$x+6=0$ or $x-5=0$

$x=-6$ $\quad x=5$

x	$x+1$
5	6
-6	-5

5 and 6 or -6 and -5

Find two consecutive even integers such that the sum of their squares is 20

x & $x+2$

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

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

$x^2+x^2+4x+4=20$

$2x^2+4x+4-20=0$

$2x^2+4x-16=0$

Divide by 2 to reduce numbers

$x^2+2x-8=0$

$(x+4)(x-2)=0$

By Z.P.R.

$x+4=0$

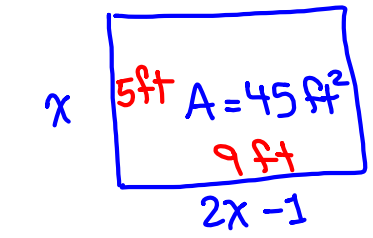
$x-2=0$

$x=-4, x=2$

x	$x+2$
2	4
-4	-2

2 and 4 or -4 and -2

Find x



$A = 45$

$LW = 45$

$x(2x-1) = 45$

$2x^2 - x = 45$

$2x^2 - x - 45 = 0$

$P = -90$

$S = -1$

-90

$9 \& -10$

$2x^2 + 9x - 10x - 45 = 0$

$x(2x+9) - 5(2x+9) = 0$

$(2x+9)(x-5) = 0$

By Z.P.R.

$2x+9=0$ or $x-5=0$

$x = \frac{-9}{2}$ ~~$x = -\frac{9}{2}$~~

$x = 5$

Solve $32x^3 - 4x^2 - 6x = 0$

Hint: Reduce numbers, Factor out GCF

Divide by 2

$16x^3 - 2x^2 - 3x = 0$

$x(16x^2 - 2x - 3) = 0$

$P = -48$, $S = -2$

$6 \& -8$

-48

$x(16x^2 + 6x - 8x - 3) = 0$

$x(2x(8x+3) - 1(8x+3)) = 0$

$x(8x+3)(2x-1) = 0$

By Zero-Product Rule

$x = 0$ $\quad 8x + 3 = 0$ $\quad 2x - 1 = 0$

$x = 0$ $\quad x = \frac{-3}{8}$ $\quad x = \frac{1}{2}$

$$\left\{ \frac{-3}{8}, 0, \frac{1}{2} \right\}$$

Solve $6x^2 = 30 - 57x$

$6x^2 - 30 + 57x = 0$

$6x^2 + 57x - 30 = 0$

Divide by 3 to reduce numbers.

$2x^2 + 19x - 10 = 0$

$P = -20$

$S = 19$

$20, -1$

-20

$2x^2 + 20x - 1x - 10 = 0$

$2x(x+10) - 1(x+10) = 0$

$(x+10)(2x-1) = 0$ by Z.P.R.

$x + 10 = 0$ or $2x - 1 = 0$

$x = -10$ $\quad x = \frac{1}{2}$ $\quad \left\{-10, \frac{1}{2}\right\}$

Class Qz

Factor Completely

① $7x - 63$

$= \boxed{7(x-9)}$

② $3x^3 - 4x^2 + 6x - 8$

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

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

③ $x^2 - x - 12$

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

Work on SG 16

④ $2x^2 + 5x - 12$

$P = -24$

$S = 5$

$8, -3$

-24

$= 2x^2 + 8x - 3x - 12$

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

$= \boxed{(x+4)(2x-3)}$