Math 115

Spring 2017

Lecture 20

Factor Completely:

① $24x^3 - 16x^2$

$= \boxed{8x^2(3x - 2)}$

② $\underbrace{4x^3 - 5x^2} + \underbrace{8x - 10}$

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

$= \boxed{(4x-5)(x^2+2)}$

③ $3x(3x+2) + 2(3x+2)$

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

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

④ $x^2 - 7x - 30$

-30

P=-30

S=-7

3 & -10

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

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

$= \boxed{(x+3)(x-10)}$

5) $3x^2 \boxed{-x} - 10$

P = -30

S = -1

-30

5 & -6

$= 3x^2 \boxed{+5x - 6x} - 10$

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

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

6) $x^2 - 49$

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

$= x^2 - 7^2$

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

7) $x^3 - 36x$

$= x(x^2 - 36)$

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

$x^2 - 36 =$

$x^2 - 6^2$

8) $x^2 + 12x + 36$

$= \boxed{(x+6)^2}$

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

9) $x^2 + 100$

$= x^2 + 10^2$ $\boxed{\text{Prime}}$

$A^2 + B^2$ is prime

10) $x^2 - 20x + 100$

$= \boxed{(x-10)^2}$

$2(x)(10)$

11) $4x^2 + 20x + 25$

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

$2(2x)(5)$

12) $x^3 + 64$

$x^3 + 4^3$

Use $A^3 + B^3$

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

$= x^3 + 4^3$

$= \boxed{(x+4)(x^2 - 4x + 16)}$

13) $x^3 - 1000$

$= x^3 - 10^3$

$A^3 - B^3$

$= \boxed{(x-10)(x^2+10x+100)}$

opp.

14) $x^4 - 25x^2$ $x^2 - 5^2$

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

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

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

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

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

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

16) $x^2 + 3x - 12$

$P = -12$

$S = 3$

-12

-1, 12

-2, 6

-3, 4

No Such numbers

$\boxed{\text{Prime}}$

17) $4x^2 \boxed{+12x} - 7$

$P = -28$

$S = 12$

-28

-1, 28

$\boxed{-2, 14}$

-4, 7

$= 4x^2 \boxed{-2x + 14x} - 7$

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

$= \boxed{(2x-1)(2x+7)}$

18) $125x^3 + 27$

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

$= (5x+3)(25x^2 - 15x + 9)$

19) $27x^3 - 125y^3$

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

$= (3x-5y)(9x^2+15xy+25y^2)$

20) $49x^2 - 70xy + 25y^2$

$\boxed{(7x-5y)^2}$

$2(7x)(5y)$

Review ch.4

1) Divide: $\dfrac{48x^5 - 6x^3}{-3x^4}$

$= \dfrac{48x^5}{-3x^4} - \dfrac{6x^3}{-3x^4}$

$= \boxed{-16x + \dfrac{2}{x}}$

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

$$\begin{array}{r l}
 & x^3 - x^2 - 2x + 1 \\
x-2 \,\big) & x^4 - 3x^3 + 0x^2 + 5x - 7 \\
 & -(x^4 - 2x^3) \\
 & -x^3 + 0x^2 + 5x - 7 \\
 & -(-x^3 + 2x^2) \\
 & -2x^2 + 5x - 7 \\
 & -(-2x^2 + 4x) \\
 & x - 7 \\
 & -(x-2) \\
 & -5
\end{array}$$

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

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

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

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

Always

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

Class Quiz

Divide:

① $\dfrac{45x^8 - 15x^2}{-3x^5}$

$= \dfrac{45x^8}{-3x^5} - \dfrac{15x^2}{-3x^5}$

$= \boxed{-15x^3 + \dfrac{5}{x^3}}$

② $\dfrac{x^3 + 2x^2 - 5x + 2}{x-1}$

$$\begin{array}{r l}
 & x^2 + 3x - 2 \\
x-1 \,\big) & x^3 + 2x^2 - 5x + 2 \\
 & -(x^3 - x^2) \\
 & 3x^2 - 5x + 2 \\
 & -(3x^2 - 3x) \\
 & -2x + 2 \\
 & -(-2x + 2) \\
 & 0
\end{array}$$

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

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

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

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

Ch.5 :

Zero - Product Rule

or

Zero - Factor Rule : If $AB = 0$, then $A = 0$ or $B = 0$ (Maybe both)

Solve $(x-3)(x+7)=0$

by Z.F.R.

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

$\boxed{x=3}$ or $\boxed{x=-7}$

$\{-7, 3\}$

Solve $\underbrace{(2x-5)(3x+8)(x-10)}_{\text{Are Factored}} = \underbrace{0}_{\text{Zero}}$

by Z.F.R.

$2x-5=0$ or $3x+8=0$ or $x-10=0$

$2x=5$ $\quad$ $3x=-8$

$\boxed{x=5/2}$ $\quad$ $\boxed{x=-8/3}$ $\quad$ $\boxed{x=10}$

$\{-8/3, 5/2, 10\}$

Solve $\underbrace{3x(x+12)(2x-3)}_{\text{one side is completely factored}} = \underbrace{0}_{\text{Zero}}$

one side is completely factored

Zero

By Z.F.R.

$3x = 0$ or $x+12=0$ or $2x-3=0$

$x = \frac{0}{3}$

$\boxed{x=0}$

$\boxed{x=-12}$

$2x = 3$

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

$\{-12, 0, 3/2\}$

Solve $\underbrace{x^2 - 36}_{\text{Factor this side completely}} = 0$

Factor this Side Completely

$x^2 - 6^2$

$A^2 - B^2$

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

By Z.F.R.

$x+6=0$

$x-6=0$

$\boxed{x=-6}$

$\boxed{x=6}$

$\{\pm 6\}$

Solve $x^2 - 10 = 3x$

① Make one Side $= 0$, and factor the other Side.

$$x^2 - 10 - 3x = 0$$

$$x^2 - 3x - 10 = 0$$

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

② use Z.F.R. & Solve

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

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

③ Ans. in Soln. Set $\boxed{\{-2, 5\}}$

Solve $9x^2 + 7x = 2$

① Make one Side $= 0$, and factor the other Side Completely.

$$9x^2 \boxed{+7x} - 2 = 0$$

$P = -18$

$S = 7$

$-1, 18$

$\boxed{-2, 9}$

$-3, 6$

-18

$$9x^2 \boxed{-2x + 9x} - 2 = 0$$

$$x(9x-2) + 1(9x-2) = 0$$

$$(9x-2)(x+1) = 0$$

by Z.F.R.

$9x - 2 = 0$ or $x + 1 = 0$

$x = \frac{2}{9}$ $\quad$ $x = -1$

$$\left\{-1, \frac{2}{9}\right\}$$

Solve

$3x^2 + 8x - 11 = 13 - 6x$

① Make one side zero, and simplify the other side.

$3x^2 + 8x - 11 - 13 + 6x = 0$

$3x^2 + 14x - 24 = 0$

② Factor completely the non zero side.

$3x^2 \boxed{+14x} - 24 = \underbrace{3x^2 \boxed{-4x} }\underbrace{\boxed{+18x} - 24}$

$P = -72$ -72 $S = 14$

$-1, 72$

$-2, 36$

$-3, 24$ $-6, 12$

$\boxed{-4, 18}$ $-8, 9$

$= x(3x-4) + 6(3x-4)$

$= (3x-4)(x+6)$

③ use Z.F.P.

$(3x - 4)(x + 6) = 0$

by Z.F.P.

$3x - 4 = 0$ or $x + 6 = 0$

$\boxed{x = \frac{4}{3}}$ $\boxed{x = -6}$ $\Rightarrow \left\{-6, \frac{4}{3}\right\}$

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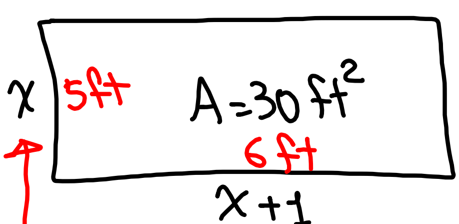
find x



$A = LW$

$x(x+1) = 30$

$x^2 + x = 30$

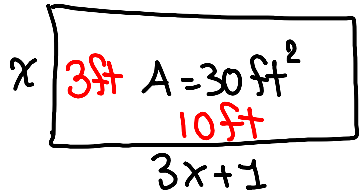
$x^2 + x - 30 = 0$

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

by Z.F.T.

$\boxed{x = 5}$, $\cancel{x = -6}$

find L & W



-1, 90
-2, 45
-3, 30
-5, 18
-6, 15
$\boxed{-9, 10}$

3ft and 10 ft

$A = LW$

$x(3x+1) = 30$

$3x^2 + x = 30$

$3x^2 \boxed{+x} - 30 = 0$

-90

$P = -90$
$S = 1$

$3x^2 \boxed{-9x + 10x} - 30 = 0$

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

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

By Z.F.T.

$\boxed{x = 3}$ $\cancel{x = -10/3}$