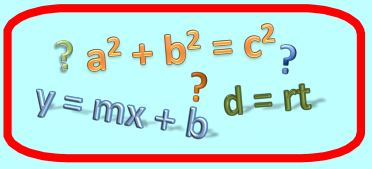
Math 115

Fall 2018

Lecture 23



Feb 19-8:47 AM

Factor Completely:

① $x^5 - 25x^3 = x^3(x^2 - 25)$

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

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

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

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

③ $x^2(x+3) - 5x(x+3) + 6(x+3)$

$= (x+3)(x^2 - 5x + 6)$

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

Dec 3-6:03 AM

④ $x^2 - 2x - 15 = x^2 - 5x + 3x - 15$

$P = -15$, $S = -2$, -15, $-5, 3$

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

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

$P = -3$, $S = -2$, -3, $-3, 1$

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

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

⑥ $4x^5 - 28x^4 + 40x^3$

$= 4x^3(x^2 - 7x + 10)$

$= \boxed{4x^3(x-2)(x-5)}$

Dec 3-6:12 AM

⑦ $2x^2 - 5x - 12 = 2x^2 - 8x + 3x - 12$

$P = -24$, $S = -5$, -24, $-8, 3$

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

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

⑧ $2x^2 + 7x + 6$

$= 2x^2 + 4x + 3x + 6$

$P = 12$, $S = 7$, 12, $4 \& 3$

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

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

⑨ $6x^2 - 11x + 3$

$= 6x^2 - 2x - 9x + 3$

$P = 18$, $S = -11$, 18, $-2 \& -9$

$= 2x(3x-1) - 3(3x-1)$

$= \boxed{(3x-1)(2x-3)}$

Dec 3-6:24 AM

(10) $x^3 - 49x$

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

(11) $81x^2 - 36 = 9(9x^2 - 4)$

$= 9[(3x)^2 - (2)^2] = 9(3x+2)(3x-2)$

(12) $x^4 + 125x$

$= x(x^3 + 125)$

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

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

(13) $2x^5 - 16x^2$

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

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

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

Dec 3-6:37 AM

(14) $36x^2 - 60x + 25 = (6x - 5)^2$

$2 \cdot 6x \cdot 5$

(15) $18x^2y + 48xy^2 + 32y^3$

$= 2y(9x^2 + 24xy + 16y^2) = 2y(3x + 4y)^2$

$2 \cdot 3x \cdot 4y$

(16) $81x^2 - 198x + 121$

$= (9x - 11)^2$

$2 \cdot 9x \cdot 11$

Dec 3-6:49 AM

Solving Polynomial Equations

1) Make RHS Zero.

2) Factor the LHS Completely.

3) Use Zero-Factor Property, and Solve all factors.

4) Final Ans in Solution Set.

Zero-Factor Prop.:
If $A \cdot B = 0$, then $A = 0$ or $B = 0$ or both are Zero.

Dec 3-7:42 AM

Solve $(x-1)(x+8)=0$

RHS = 0 ✓ LHS Completely factored ✓

By Z.F.P. $\Rightarrow$ $x-1=0$ or $x+8=0$

$\boxed{x=1}$ $\boxed{x=-8}$

$\{-8, 1\}$

Solve $(2x-5)(3x+4)=0$

RHS = 0 ✓

LHS Factored Completely ✓

By Z.F.P.

$2x-5=0$ or $3x+4=0$

$2x=5$ $3x=-4$

$\boxed{x=\frac{5}{2}}$ $\boxed{x=\frac{-4}{3}}$ $\left\{\frac{-4}{3}, \frac{5}{2}\right\}$

Dec 3-7:45 AM

Solve $x^2 + 6 = 5x$

Make RHS=0 $x^2 + 6 - 5x = 0$

Factor LHS $x^2 - 5x + 6 = 0$

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

By Z.F.P. $x-2=0$ or $x-3=0$

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

Soln Set $\{2, 3\}$

Dec 3-7:50 AM

Solve $2x^2 + 20 = 13x$

1) RHS=0 $2x^2 + 20 - 13x = 0$

2) order, simplify, factor $2x^2 - 13x + 20 = 0$

$P = 40$

$S = -13$

$-8, -5$

40

$2x^2 - 8x - 5x + 20 = 0$

$2x(x-4) - 5(x-4) = 0$

3) use Z.F.P. $(x-4)(2x-5) = 0$

$x-4=0$ $2x-5=0$

4) Solution Set $\left\{\frac{5}{2}, 4\right\}$ $\boxed{x=4}$ $\boxed{x=\frac{5}{2}}$

Dec 3-7:52 AM

Solve $x^2 = x + 30$

$x^2 - x - 30 = 0$

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

By Z.F.P.,

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

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

$\{-5, 6\}$

Dec 3-7:57 AM

Solve $2x^2 = x + 6$

$2x^2 - x - 6 = 0$

$P = -12$

$S = -1$

-4 & 3

-12

$2x^2 - 4x + 3x - 6 = 0$

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

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

By Z.F.P.

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

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

$\left\{\frac{-3}{2}, 2\right\}$

Dec 3-8:00 AM

Solve $x^2 = 24 - 5x$

$x^2 - 24 + 5x = 0$

$x^2 + 5x - 24 = 0$

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

By Z.F.P.

$x+8=0$ or $x-3=0$

$x=-8$ $x=3$ $\{-8, 3\}$

Dec 3-8:05 AM

Solve $x(x+7) = 30$

$x^2 + 7x = 30$

$x^2 + 7x - 30 = 0$

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

By Z.F.P.

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

$x=-10$ $x=3$ $\{-10, 3\}$

Dec 3-8:09 AM

Solve $(2x+3)(x+4)=25$

Foil & Simplify

$2x^2+8x+3x+12=25$

$2x^2+11x+12=25$

RHS = 0, Simplify

$2x^2+11x+12-25=0$

$2x^2+11x-13=0$

Factor LHS Completely

$P=-26$

$S=11$

$-2,13$

-26

By Z.F.P.

$2x^2+13x-2x-13=0$

$x(2x+13)-1(2x+13)=0$

$(2x+13)(x-1)=0$

$2x+13=0$ or $x-1=0$

$x=-\frac{13}{2}$ $x=1$

$\{-\frac{13}{2}, 1\}$

Dec 3-8:12 AM

Solve $3x(x+1)=(2x+3)(x+1)$

Hint: Distribute & Foil, then Simplify

$3x^2+3x=2x^2+2x+3x+3$

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

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

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

By Z.F.P. $x-3=0$ $x=3$ $x+1=0$ $x=-1$

$\{-1, 3\}$

Dec 3-8:19 AM

Solve $x^2 = 100$

$x^2 - 100 = 0$

$x^2 - 10^2 = 0$

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

by Z.F.P.

$x + 10 = 0$ $\quad$ $x - 10 = 0$

$\boxed{x = -10}$ $\quad$ $\boxed{x = 10}$

$\{-10, 10\}$ or $\{\pm 10\}$

Dec 3-8:26 AM

Solve $36x^2 - 40 = 9$

$36x^2 - 40 - 9 = 0$

$36x^2 - 49 = 0$

$(6x)^2 - (7)^2 = 0$

$(6x + 7)(6x - 7) = 0$

By Z.F.P.

$6x + 7 = 0$ $\quad$ $6x - 7 = 0$

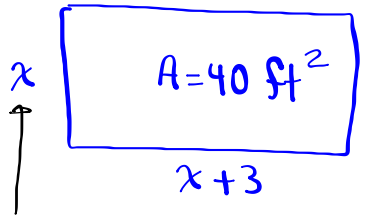
$6x = -7$ $\quad$ $6x = 7$

$\boxed{x = -\frac{7}{6}}$ $\quad$ $\boxed{x = \frac{7}{6}}$

$\left\{\pm \frac{7}{6}\right\}$

Dec 3-8:28 AM

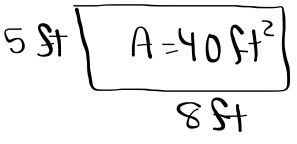
Find x:



Can x be negative?

NO

$x = 5$



Rectangle

$A = 40$

$LW = 40$

$x(x+3) = 40$

$x^2 + 3x = 40$

$x^2 + 3x - 40 = 0$

$(x+8)(x-5) = 0$

By Z.F.P.,

$x+8=0$ $\quad x-5=0$

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

Dec 3-8:45 AM

The Product of two Consecutive integers is 90

Find all such integers.

x & $x+1$

$x(x+1) = 90$

$x^2 + x = 90$

$x^2 + x - 90 = 0$

$(x+10)(x-9) = 0$

By Z.F.P.

$x+10=0$ $\quad x-9=0$

$x=-10$ $\quad x=9$

x	$x+1$
9	10
-10	-9

9 & 10
or
-10 & -9

Dec 3-8:49 AM

The product of two consecutive even integers is 80.

Find all such integers.

x & $x+2$

$x(x+2) = 80$

Solve $x(x+2) = 80$

$x^2 + 2x = 80$

$x^2 + 2x - 80 = 0$

$(x+10)(x-8) = 0$

By Z.F.P.

$x+10 = 0$ or $x-8 = 0$

$x = -10$ $x = 8$

x	$x+2$
8	10
-10	-8

8 & 10 or -10 & -8

Dec 3-8:53 AM

The area of a rectangular shape is $63\ m^2$.

Its dimensions are two consecutive odd integers.

Find its dimensions.

$A = 63$

$LW = 63$

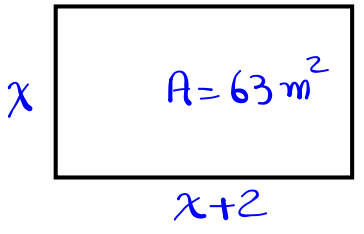
$x(x+2) = 63$

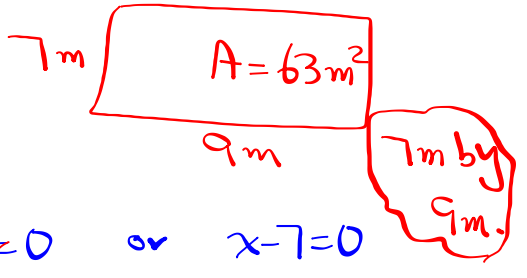
$x^2 + 2x - 63 = 0$

$(x+9)(x-7) = 0$

By Z.F.P., $x+9 = 0$ or $x-7 = 0$

$x = -9$ $x = 7$

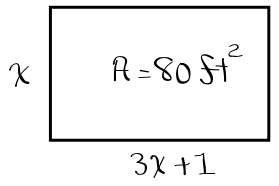




Dec 3-8:59 AM

The area of a rectangular shape is $80\ ft^2$. Its length is 1 ft longer than 3 times its width.

① Draw & label



② Find its dimensions.

$A = 80$

$LW = 80$

$x(3x+1) = 80$

$3x^2 + x = 80$

$3x^2 + x - 80 = 0$

$P = -240$, $S = 1$, -15 & 16, -240

$3x^2 - 15x + 16x - 80 = 0$

$3x(x-5) + 16(x-5) = 0$

$(x-5)(3x+16) = 0$

By Z.F.P. $\Rightarrow x = 5$, $x = -\frac{16}{3}$

5 ft, $A = 80\ ft^2$, 16 ft

Dec 3-9:04 AM

Factor Completely: Box Your Final Answer

① $7x + 14$

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

② $2xy - 8y + 3x - 12$

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

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

③ $x^2 + 6x - 27$

$= \boxed{(x+9)(x-3)}$

④ $25x^2 - 121$

$= (5x)^2 - (11)^2$

$= \boxed{(5x+11)(5x-11)}$

Dec 3-9:11 AM