Math 115

Spring 2019

Lecture 23

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

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

Factor Completely:

① $x^3 - 9x = x(x^2 - 9)$

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

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

③ $4x^5 - 108x^2$

$= 4x^2(x^3 - 27)$

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

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

Always take care of GCF.

② $2x^4 + 16x$

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

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

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

④ $2x^3 - x^2 + 8x - 4$

$= x^2(2x-1) + 4(2x-1)$

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

⑤ $x^3 - 10x^2 + 9x$

$= x(x^2 - 10x + 9)$

$= x(x-1)(x-9)$

⑥ $5x^4 + 20x^3 - 160x^2$

$= 5x^2(x^2 + 4x - 32)$

$= 5x^2(x+8)(x-4)$

⑦ $x^2y + 19xy + 60y$

$= y(x^2 + 19x + 60)$

$= y(x+4)(x+15)$

⑧ $x^2 - 10 + 4x$

$= x^2 + 4x - 10$

$= (x + \bigcirc)(x - \bigcirc)$

1, 10

2, 5

Prime

⑨ $x^2(x+5) - 25(x+5)$

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

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

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

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

⑩ $x^3(x-4) - 64(x-4)$

$= (x-4)(x^3 - 64)$

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

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

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

⑪ $16x^2(4x-3) - 9(4x-3)$

$= (4x-3)(16x^2 - 9)$

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

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

⑫ $x^2(x+3) + 6x(x+3) + 9(x+3)$

$= (x+3)(x^2 + 6x + 9)$

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

$= (x+3)^3$

Find the missing factor:

(13) $5x^2 + 22x + 8 = (5x + 2)(x + 4)$

$2x$, $20x$

(14) $4y^2 - 20y + 25 = (2y - 5)(2y - 5)$

$-10y$, $-10y$

$= (2y-5)^2$

(15) $6x^2 + 11x - 10 = (2x + 5)(3x - 2)$

$15x$, $-4x$

(16) $9x^2 - 49 = (3x + 7)(3x - 7)$

$21x$, $-21x$

(17) $2x^2 + 13x + 15$

$P = 30$, $S = 13$, $3, 10$

$= 2x^2 + 3x + 10x + 15$

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

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

(18) $12x^2 + 17x + 5$

$P = 60$, $S = 17$, 5 & 12

$= 12x^2 + 12x + 5x + 5$

$= 12x(x + 1) + 5(x + 1)$

$= \boxed{(x+1)(12x + 5)}$

(19) $7x + 12x^2 - 12$

$= 12x^2 + 7x - 12$

$P = -144$, $S = 7$, $16, -9$

$= 12x^2 + 16x - 9x - 12$

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

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

(20) $3x^2 + 5 + 20x$

$= 3x^2 + 20x + 5$

$P = 15$, $S = 20$

Prime

(21) $8x^3 - 17x^2 + 9x = x(8x^2 - 17x + 9)$

$P = 72$, $S = -17$, $-8 \& -9$

$8x^2 - 8x - 9x + 9$

$8x(x-1) - 9(x-1)$

$= (x-1)(8x-9)$

$x(x-1)(8x-9)$

(22) $15x^2y^2 - 16xy^2 - 15y^2$

$= y^2(15x^2 - 16x - 15)$

$P = -225$, $S = -16$, $-25 \& 9$

$15x^2 - 25x + 9x - 15$

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

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

(23) $9x^2 - 24x + 16 = 9x^2 - 12x - 12x + 16$

$P = 144$, $S = -24$, $-12 \& -12$

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

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

(24) $16x^2 + 24x + 9$

$P = 144$, $S = 24$, $12, 12$

$= 16x^2 + 12x + 12x + 9$

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

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

$= (4x+3)^2$

Use Zero-Factor Prop. to Solve:

① $(3x-5)(x+8)=0$

$3x-5=0$ OR $x+8=0$

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

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

② $x(2x-7)=0$

$x=0$ OR $2x-7=0$

$x=0$ $\quad x=\frac{7}{2}$

$\{0, \frac{7}{2}\}$

③ $(x+4)(x-4)(x-10)=0$

$x+4=0$ OR $x-4=0$ OR $x-10=0$

$x=-4$ $\quad x=4$ $\quad x=10$

$\{\pm 4, 10\}$

Solve by factoring:

$x^2-22=9x$

$x^2-22-9x=0$

$x^2-9x-22=0$

$(x-11)(x+2)=0$

by Z.F.P.

$x-11=0$ $\quad x+2=0$

$x=11$ $\quad x=-2$

$\{-2, 11\}$

$4x^2=20x-25$

$4x^2-20x+25=0$

$P=100$

100 $\quad S=-20$

$-10, -10$

$4x^2-10x-10x+25=0$

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

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

$2x-5=0$ $\quad x=5/2$

$\{5/2\}$ Repeated Soln.

Find two cons. odd integers such that their product is 15.

x & $x+2$

$x(x+2)=15$

$x^2+2x=15$

$x^2+2x-15=0$

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

by Z.F.P.

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

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

3 & 5

OR

-5 & -3

Find two cons. even integers such that the sum of their squares is 100.

x & $x+2$

$x^2+(x+2)^2=100$

$x^2+(x+2)(x+2)=100$

$x^2+x^2+2x+2x+4-100=0$

$2x^2+4x-96=0$

Divide by 2 to reduce

$x^2+2x-48=0$

$(x+8)(x-6)=0$

$x+8=0$ or $x-6=0$

$x=-8$ $\quad x=6$

x	$x+2$
6	8
-8	-6

Area of a rectangular room is $35\,m^2$. The length is 3m shorter than twice the width. Find its dimensions.

$A = 35$

$LW = 35$

$x(2x-3) = 35$

$2x^2 - 3x - 35 = 0$

$P = -70$

$S = -3$

$7 \& -10$

-70

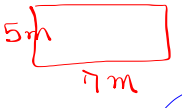
$2x^2 + 7x - 10x - 35 = 0$

$x(2x+7) - 5(2x+7) = 0$

$(2x+7)(x-5) = 0$

$x = -\frac{7}{2}$ ✗

$x = 5$



5m by 7m

The graph of $y = x^2 - 10x + 24$ has two x-Ints. Find both of them.

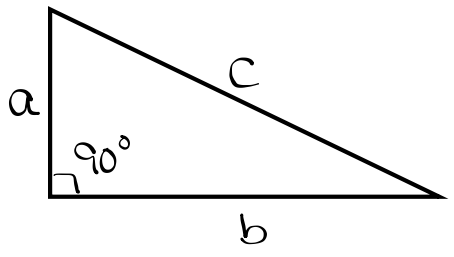
$y = 0 \rightarrow x^2 - 10x + 24 = 0$

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

$x = 6$ $\quad x = 4$

(6,0) & (4,0)

Right Triangle

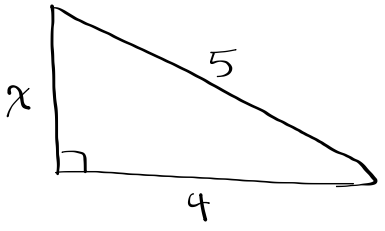


a & b → legs

c → Hypotenuse

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

Pythagorean Thrm



Find x

$x^2+4^2=5^2$

$x^2+16=25$

$x^2+16-25=0$

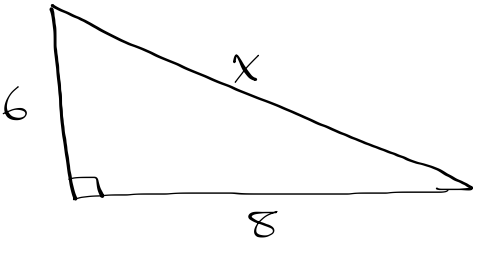
$x^2-9=0$

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

$x=-3$ ~~$x=-3$~~

$x=3$

Find x



$6^2+8^2=x^2$

$36+64=x^2$

$100=x^2$

$x^2=100$

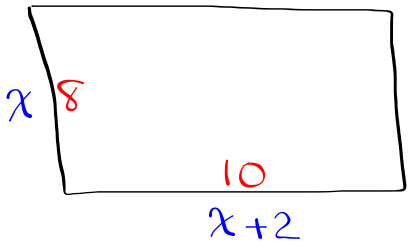
$x^2-100=0$

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

$x=10$ $x=-10$ ~~$x=-10$~~

The dimensions of a rectangular shape with area $80\ ft^2$ are two Cons. even integers.

Find its dimensions.



$A = 80$

$LW = 80$

$x(x+2) = 80$

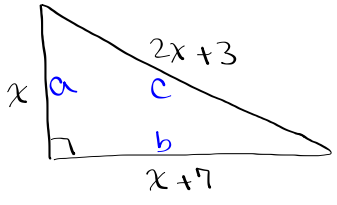
$x^2 + 2x - 80 = 0$

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

$x = -10$ ~~$x = -10$~~ $\quad x = 8$

8 ft by 10 ft

Find all 3 sides:



Right Triangle

Pythagorean thrm

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

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

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

$x^2 + x^2 + 7x + 7x + 49 = 4x^2 + 6x + 6x + 9$

$2x^2 + 14x + 49 = 4x^2 + 12x + 9$

$2x^2 + 14x + 49 - 4x^2 - 12x - 9 = 0$

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

Divide by -2

$x^2 - x - 20 = 0$

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

$x = 5$ $\quad$ ~~$x = -4$~~

5, 12, and 13

Graph of $y = x^2 - 36$ has two x-Ints. Find them.

$y = 0$

$x^2 - 36 = 0$

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

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

$(6,0)$ & $(-6,0)$

Special Factoring: Trinomials

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

$x^2 + 50x + 625 = (x + 25)^2$

$9x^2 + 144x + 576 = (3x + 24)^2$

This problem had a GCF.

$= 9(x + 8)^2$

$49x^2 + 140xy + 100y^2 = (7x + 10y)^2$

$64x^2 + 400xy + 625y^2 = (8x + 25y)^2$

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

$4x^2 - 12x + 9 = (2x - 3)^2$

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

Review exam 1 & exam 2

Project III due Monday

Lecture 6:00 – 7:45

Exam 7:50 – 9:30

Long Division, Exponential rules

Factoring, Similar word problems

Operations with Polynomials

Graph & shade, Parallel & Perpendicular lines