

# Math 115

## Fall 2017

### Lecture 26



Solve using Zero-Factor Property:

$$(3x-7)(3x+7)(2x+5)(2x-5)=0$$

If  $A \cdot B = 0$ , then  $A=0$  or  $B=0$

$$3x-7=0$$

$$3x+7=0$$

$$2x+5=0$$

$$2x-5=0$$

$$3x=7$$

$$3x=-7$$

$$2x=-5$$

$$2x=5$$

$$\boxed{x = \frac{7}{3}}$$

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

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

$$\boxed{x = \frac{5}{2}}$$

$$\left\{ \pm \frac{7}{3}, \pm \frac{5}{2} \right\}$$

Solve by factoring method: RHS 0  
LHS Comp. factored  
Use Z.F.P.

$$1) x^2 - 36 = 0$$

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

$$\left. \begin{array}{l} x+6=0 \\ x-6=0 \end{array} \right\} \pm 6$$

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

$$2) x^2 + 8x + 16 = 0$$

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

$$\left. \begin{array}{l} x+4=0 \\ x+4=0 \end{array} \right\} -4$$

$$\boxed{x=-4} \text{ Repeated Soln.}$$

$$3) 2x^2 - 5x - 3 = 0$$

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

$$2x+1=0$$

$$x-3=0$$

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

$$\boxed{x=3}$$

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

Solve by Quadratic Formula

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

$$ax^2 + bx + c = 0$$

$$3x^2 + 5x - 2 = 0$$

$$a=3, b=5, c=-2$$

$$b^2 - 4ac = (5)^2 - 4(3)(-2) = 49$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-5 \pm \sqrt{49}}{2(3)}$$

$$= \frac{-5 \pm 7}{6}$$

$$x = \frac{-5+7}{6} = \frac{2}{6} = \boxed{\frac{1}{3}}$$

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

$$x = \frac{-5-7}{6} = \frac{-12}{6} = \boxed{-2}$$

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

① Foil, Simplify, write in  $ax^2 + bx + c = 0$  form

$$6x^2 - 4x - 9x + 6 - 4 = 0$$

$$6x^2 - 13x + 2 = 0$$

② Find  $a$ ,  $b$ , and  $c$ , then compute  $b^2 - 4ac$

$$a = 6$$

$$b = -13$$

$$c = 2$$

$$b^2 - 4ac = (-13)^2 - 4(2)(6) = 121$$

③ Use  $Q$ -formula to solve.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{13 \pm \sqrt{121}}{2(6)} = \frac{13 \pm 11}{12}$$

$$x = \frac{13 - 11}{12} = \frac{1}{6}$$

$$\left\{ \frac{1}{6}, 2 \right\}$$

$$x = \frac{13 + 11}{12} = 2$$

Two legs of a right triangle are 6 & 8 cm.  
Find its hypotenuse.

By Pythagorean thm

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

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

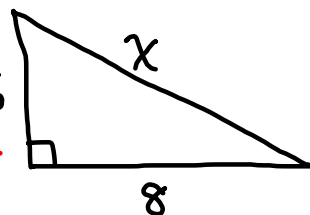
$$100 = x^2 \rightarrow x^2 - 100 = 0$$

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

$$\boxed{10 \text{ cm}}$$

$$\cancel{x = -10}$$

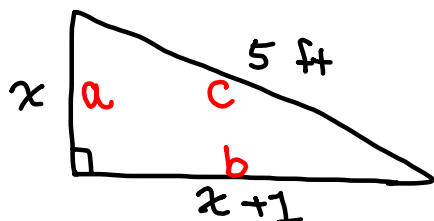
$$\boxed{x = 10}$$



The hypotenuse of a right triangle is 5 ft.

The legs are two cons. integers.

Find both legs. By Pythagorean Thm



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

$$x^2 + (x+1)^2 = 5^2$$

$$x^2 + (x+1)(x+1) = 25$$

$$x^2 + x^2 + x + x + 1 = 25$$

$$2x^2 + 2x + 1 - 25 = 0$$

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

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

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

~~$$x = -4$$~~

$$x = 3$$

3 ft & 4 ft

Reduce

$$\begin{aligned} \textcircled{1} \quad & \frac{2x^2}{10x^3 - 2x^2} \\ &= \frac{\cancel{2x^2}^1}{\cancel{2x^2}(5x-1)} \\ &= \boxed{\frac{1}{5x-1}} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad & \frac{9x^2 + 13x + 4}{8x^2 + x - 7} \\ &= \frac{(9x+4)(\cancel{x+1})}{(8x-7)(\cancel{x+1})} \\ &= \boxed{\frac{9x+4}{8x-7}} \end{aligned}$$

Find all excluded values → Deno = 0  
Solve

①  $\frac{x}{x-7}$

$x-7=0$  E.V. 7  
 $x=7$

②  $\frac{x-5}{2x+3}$

$2x+3=0$

$2x=-3$

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

E.V.  $-\frac{3}{2}$

③  $\frac{\text{whatever}}{x^2-13x+36}$

$x^2-13x+36=0$

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

$x=4$

$x=9$

E.V.: 4 & 9

Simplify:

1)  $\frac{3x+3}{5x^2-5x} \cdot \frac{2x^2+x-3}{4x^2-9} = \frac{3(x+1)}{5x(x-1)} \cdot \frac{(2x+3)(x-1)}{(2x+3)(2x-3)}$   
 $(\quad)^2 - (\quad)^2 = \frac{3(x+1)}{5x(2x-3)}$

2)  $\frac{x^2+7x+10}{x^2+x-2} \div \frac{x^2+2x-15}{x-1}$

$= \frac{(x+5)(x+2)}{(x+2)(x-1)} \cdot \frac{x-1}{(x+5)(x-3)} = \frac{1}{x-3}$

Adding/Subtracting like fractions  
Same deno.

$$\frac{3}{10} + \frac{1}{10} = \frac{3+1}{10} = \frac{4}{10} = \frac{2}{5}$$

$$\frac{5}{12} - \frac{1}{12} = \frac{5-1}{12} = \frac{4}{12} = \frac{1}{3}$$

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

$$\begin{aligned} \frac{3x-5}{x^2-9} + \frac{2x-10}{x^2-9} &= \frac{3x-5+2x-10}{x^2-9} \\ &= \frac{5x-15}{x^2-9} = \frac{5(\cancel{x-3})}{(x+3)(\cancel{x-3})} \\ &= \frac{5}{x+3} \end{aligned}$$

$$\frac{3x^2 + 2x}{x-1} - \frac{10x - 5}{x-1}$$

Be aware of

$$= \frac{3x^2 + 2x - 10x + 5}{x-1} = \frac{3x^2 - 8x + 5}{x-1}$$

$$= \frac{(3x-5)(\cancel{x-1})}{\cancel{x-1}}$$

$$= \boxed{3x-5}$$

Simplify:

$$\frac{3x-1}{x^2+5x-6} - \frac{2x-7}{x^2+5x-6} =$$

$$\frac{3x-1-2x+7}{x^2+5x-6} = \frac{x+6}{x^2+5x-6}$$

$$= \frac{\cancel{x+6}}{(\cancel{x+6})(x-1)}$$

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

Simplify:

$$\frac{6x^2}{2x-5} - \frac{25+2x^2}{2x-5}$$

$$= \frac{6x^2 - 25 - 2x^2}{2x - 5} = \frac{4x^2 - 25}{2x - 5}$$

$$= \frac{(2x+5)(\cancel{2x-5})}{\cancel{2x-5}}$$

$$= \boxed{2x+5}$$

How to add/subtract rational expressions  
when denominators are different

Basic Math:

$$\frac{2}{3} - \frac{1}{4} = \frac{2 \cdot 4}{3 \cdot 4} - \frac{1 \cdot 3}{4 \cdot 3} = \frac{8}{12} - \frac{3}{12}$$

$$LCD = 3 \cdot 4 = 12$$

$$= \frac{8-3}{12} = \boxed{\frac{5}{12}}$$

$$\frac{2}{x-3} - \frac{1}{x+4} = \frac{2 \cdot (x+4)}{(x-3)(x+4)} - \frac{1(x-3)}{(x+4)(x-3)}$$

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

$$\boxed{\frac{x+11}{(x-3)(x+4)}}$$

$$= \frac{2(x+4) - 1(x-3)}{(x-3)(x+4)} = \frac{2x+8-x+3}{(x-3)(x+4)}$$



Simplify  $\frac{3}{x+4} - \frac{2}{x-1}$

$$\text{LCD} = (x+4)(x-1)$$

$$= \frac{3(x-1)}{(x+4)(x-1)} - \frac{2(x+4)}{(x-1)(x+4)}$$

$$= \frac{3(x-1) - 2(x+4)}{(x+4)(x-1)} = \frac{3x-3-2x-8}{(x+4)(x-1)} = \frac{x-11}{(x+4)(x-1)}$$

Simplify

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

$$\text{LCD} = (x+2)(x+4) = \frac{x(x+4) - 2(x+2)}{(x+2)(x+4)}$$

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

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

Simplify  $\frac{3}{4} - \frac{5}{6} = \frac{3 \cdot 3}{4 \cdot 3} - \frac{5 \cdot 2}{6 \cdot 2}$

$$4 = 2 \cdot 2 \square$$

$$6 = 2 \square \cdot 3$$

$$\text{LCD} = 2 \cdot 2 \cdot 3$$

$$= 12$$

$$= \frac{9}{12} - \frac{10}{12} = \frac{9-10}{12}$$

$$= \frac{-1}{12}$$

Simplify  $\frac{3}{x^2-9} - \frac{2}{x^2+7x+12}$

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

$$x^2+7x+12 = (x+3)(x+4)$$

$$(x+4)$$

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

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

Distribute & Simplify

$$= \frac{3(x+4) - 2(x-3)}{(x+3)(x-3)(x+4)} = \frac{x+18}{(x+3)(x-3)(x+4)}$$

Simplify:  $\frac{8}{x^2-5x+6} - \frac{6}{x-3}$

$$x^2-5x+6 = (x-3)(x-2) \quad \text{LCD} = (x-3)(x-2)$$

$$x-3 = x-3$$

$$= \frac{8}{(x-3)(x-2)} - \frac{6 \cdot (x-2)}{(x-3)(x-2)}$$

$$= \frac{8 - 6(x-2)}{(x-3)(x-2)} = \boxed{\frac{-6x + 20}{(x-3)(x-2)}}$$

Simplify

$$\frac{8}{x^2+6x+5} - \frac{3}{x^2+4x-5} + \frac{2}{x^2-1}$$

$$= \frac{8(x-1)}{(x+5)(x+1)(x-1)} - \frac{3(x+1)}{(x+5)(x-1)(x+1)} + \frac{2(x+5)}{(x+1)(x-1)(x+5)}$$

$$= \frac{8x - 8 - 3x - 3 + 2x + 10}{(x+5)(x+1)(x-1)} = \boxed{\frac{7x - 1}{(x+5)(x+1)(x-1)}}$$

$x$ -Int  $\Rightarrow$  Let  $y=0$ , Solve for  $x$ .

$y$ -Int  $\Rightarrow$  Let  $x=0$ , Solve for  $y$ .

Consider  $y = x^2 - 5x - 36$

$y$ -Int  $(0, -36)$   $y = 0^2 - 5(0) - 36 = -36$

$x$ -Int  $(9, 0)$   $x^2 - 5x - 36 = 0$   
 $(-4, 0)$   $(x-9)(x+4) = 0$   
 $\downarrow$   $\downarrow$   
 $x=9$   $x=-4$

Find all intercepts for the graph of

$y = 2x^2 - 3x - 5$

$y$ -Int  $(0, -5)$   $y = 2(0)^2 - 3(0) - 5 = -5$

$x$ -Int  $(-1, 0)$   $2x^2 - 3x - 5 = 0$   
 $(\frac{5}{2}, 0)$   $a=2$   $b=-3$   $c=-5$   
 $b^2 - 4ac = (-3)^2 - 4(2)(-5) = 49$

$(2x-5)(x+1) = 0$   $x = \frac{-(-3) \pm \sqrt{49}}{2(2)}$   
 $\downarrow$   $\downarrow$   $\rightarrow x = \frac{3+7}{4} = \frac{5}{2}$   
 $x = \frac{5}{2}$   $x = -1$   $= \frac{3 \pm 7}{4} \rightarrow x = \frac{3-7}{4} = -1$

Due Monday : SG 15 & 16

Due Tuesday : SG 17 and  
Project 4

work on SG 18 → as  
well.