Math 115

Spring 2019

Lecture 25

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

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

Simplify:

1) $\dfrac{\cancel{32}^{8}\, x^8 y^2}{\cancel{4}\, x^3 y^{10}} = \dfrac{8x^5}{y^8}$

2) $\dfrac{3x^2 - 5x}{6x - 10}$

$= \dfrac{x\cancel{(3x-5)}}{2\cancel{(3x-5)}} = \dfrac{x}{2}$

3) $\dfrac{x^2 + 10x + 25}{x^2 - 25}$

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

$= \dfrac{x+5}{x-5}$

4) $\dfrac{x^2 - 9}{x^3 - 27}$

$= \dfrac{x^2 - 3^2}{x^3 - 3^3}$

$= \dfrac{(x+3)\cancel{(x-3)}}{\cancel{(x-3)}(x^2+3x+9)} = \dfrac{x+3}{x^2+3x+9}$

5) $\dfrac{x^2 + x - 30}{x^2 - 36}$

$= \dfrac{(x+6)(x-5)}{(x+6)(x-6)}$

1, 30
2, 15
3, 10
5, 6

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

6) $\dfrac{5x^2 + 4x - 9}{3x^2 + 5x - 8}$

$5x^2 + 4x - 9 = 5x^2 - 5x + 9x - 9$

P = -45
S = 4 -45
9 & -5

$= 5x(x-1) + 9(x-1)$

$= (x-1)(5x+9)$

$= \dfrac{(x-1)(5x+9)}{(3x+8)(x-1)} = \boxed{\dfrac{5x+9}{3x+8}}$

Find all excluded values:

Deno = 0, then Solve

1) $\dfrac{x+8}{x-6}$

$x - 6 = 0$

$\boxed{x = 6}$

E.V. 6

2) $\dfrac{2x-5}{3x+8}$

$3x + 8 = 0$

$3x = -8$

$\boxed{x = \frac{-8}{3}}$

E.V. $-8/3$

3) $\dfrac{10}{(x-4)(x+11)}$

$(x-4)(x+11) = 0$

by Z.P.R.

$x - 4 = 0$ or $x + 11 = 0$

$\boxed{x = 4}$ $\boxed{x = -11}$

E.V. -11, 4

4) $\dfrac{-6}{x^2 - 49}$

$x^2 - 49 = 0$

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

by Z.P.R.

$x + 7 = 0$ $x = -7$

$x - 7 = 0$ $x = 7$

E.V. ± 7

5) $\dfrac{-8x}{x^2-2x-24}$

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

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

by Z.P.R.

$x-6=0 \qquad x+4=0$

$x=6 \qquad x=-4$

E.V. -4 & 6

6) $\dfrac{2x+6}{2x^2-x-10}$

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

$ax^2+bx+c=0$

$a=2 \quad b=-1 \quad c=-10$

$b^2-4ac=(-1)^2-4(2)(-10)=81$

$x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}=\dfrac{-(-1)\pm\sqrt{81}}{2(2)}$

$=\dfrac{1\pm9}{4}$

$x=\dfrac{1+9}{4}=\dfrac{10}{4}=\boxed{\dfrac{5}{2}}$

$x=\dfrac{1-9}{4}=\dfrac{-8}{4}=\boxed{-2}$

E.V. -2 & $5/2$

Use the quadratic formula to find all excluded values of $\dfrac{6x-5}{6x^2+11x-17}$.

Deno$=0$, Solve

$6x^2+11x-17=0$

$a=6 \quad b=11 \quad c=-17$

$b^2-4ac=11^2-4(6)(-17)$

$=121+408$

$=529$

$x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}=\dfrac{-11\pm\sqrt{529}}{2(6)}$

$=\dfrac{-11\pm23}{12}$

$x=\dfrac{-11+23}{12}=\dfrac{12}{12}=\boxed{1}$

$x=\dfrac{-11-23}{12}=\dfrac{-34}{12}=\boxed{\dfrac{-17}{6}}$

E.V. 1 & $\dfrac{-17}{6}$

Multiply: $\dfrac{x^2+8x+12}{x^2+8x+16} \cdot \dfrac{x^2-16}{x^2-4}$

$= \dfrac{(x+6)(x+2)}{(x+4)(x+4)} \cdot \dfrac{(x+4)(x-4)}{(x+2)(x-2)}$

$= \boxed{\dfrac{(x+6)(x-4)}{(x+4)(x-2)}}$

Divide: $\dfrac{x^2+x-12}{x^2-9} \div \dfrac{x^2-16}{x^2+6x+9}$

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

Divide:

$\dfrac{2x^2+3x-5}{3x^2+4x-7} \div \dfrac{2x^2+5x}{3x^2+7x}$

$= \dfrac{(2x+5)(x-1)}{(3x+7)(x-1)} \cdot \dfrac{x(3x+7)}{x(2x+5)} = \dfrac{x}{x} = \boxed{1}$

Solve $(4x-3)(2x+5)=7$ by quadratic formula.

Hint: FOIL, Simplify, write in $ax^2+bx+c=0$ form.

$8x^2+20x-6x-15-7=0$

$8x^2+14x-22=0$

Divide by 2 to reduce

$4x^2+7x-11=0$

$a=4 \quad b=7 \quad c=-11$

$b^2-4ac=7^2-4(4)(-11)$

$=49+176=225$

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

$x=\dfrac{-7\pm\sqrt{225}}{8}$

$=\dfrac{-7\pm15}{8}$

$x=\dfrac{-7-15}{8} \qquad x=\dfrac{-7+15}{8}$

$x=\dfrac{-22}{8} \qquad x=\dfrac{8}{8}$

$x=\dfrac{-11}{4} \qquad x=1$

$\left\{-\frac{11}{4}, 1\right\}$

SG 17 Due Wednesday

Adding / Subtracting like rational expressions:

Same denominators

$$\frac{A}{D}+\frac{B}{D}-\frac{C}{D}=\frac{A+B-C}{D}$$

Simplify

$$\frac{x^2}{x^2-4}-\frac{2x}{x^2-4}=\frac{x^2-2x}{x^2-4}$$

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

Simplify:

① $\frac{4}{x+3} - \frac{1}{x+3}$

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

② $\frac{x^2}{x+5} + \frac{5x}{x+5}$

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

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

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

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

④ $\frac{x^2-3x}{x+3} - \frac{18}{x+3}$

$= \frac{x^2-3x-18}{x+3}$

$= \frac{(x-6)(x+3)}{x+3}$

$= \boxed{x-6}$

Simplify

① $\frac{x^2}{x^2-9} - \frac{3x}{x^2-9}$

$= \frac{x^2-3x}{x^2-9}$

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

② $\frac{x^2+15}{x^2-25} - \frac{8x}{x^2-25}$

$= \frac{x^2+15-8x}{x^2-25}$

$= \frac{x^2-8x+15}{x^2-25}$

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

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

Simplify: $\frac{5}{7} - \frac{1}{2} = \frac{5 \cdot 2}{7 \cdot 2} - \frac{1 \cdot 7}{2 \cdot 7}$

$LCD = 7 \cdot 2 = 14$

$= \frac{5 \cdot 2 - 1 \cdot 7}{14} = \frac{10 - 7}{14} = \boxed{\frac{3}{14}}$

Simplify $\frac{2x-6}{4} + \frac{x+5}{6} = \frac{(2x-6) \cdot 3}{4 \cdot 3} + \frac{(x+5) \cdot 2}{6 \cdot 2}$

$4 = 2 \cdot 2$

$6 = 2 \cdot 3$

$LCD = 2 \cdot 2 \cdot 3 = 12$

$= \frac{3(2x-6)}{4 \cdot 3} + \frac{2(x+5)}{2 \cdot 6}$

$= \frac{3(2x-6) + 2(x+5)}{12} = \frac{8x - 8}{12}$

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

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

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

$x+5 = (x+5)$

$x+3 = \quad (x+3)$

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

$= \frac{3x+9-2x-10}{(x+5)(x+3)}$

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

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

$(x-3) = (x-3)$
$(x+5) \qquad (x+5)$

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

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

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

$= \frac{x^2+5x-2x+6}{(x-3)(x+5)}$

$= \boxed{\frac{x^2+3x+6}{(x-3)(x+5)}}$

Simplify $\frac{2}{x^2+7x+12} - \frac{1}{x^2-9}$

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

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

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

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

$= \frac{2(x-3) - 1(x+4)}{(x+3)(x+4)(x-3)} = \frac{2x-6-x-4}{(x+3)(x+4)(x-3)} =$

$\Rightarrow = \boxed{\frac{x-10}{(x+3)(x+4)(x-3)}}$

Simplify: $\dfrac{3}{x^2+5x+6} - \dfrac{2}{x^2-4}$

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

$= \dfrac{3(x-2) - 2(x+3)}{(x+2)(x+3)(x-2)} = \dfrac{3x-6-2x-6}{(x+2)(x+3)(x-2)}$

$= \boxed{\dfrac{x-12}{(x+2)(x+3)(x-2)}}$

The sum of square of two consecutive odd integers is 74.

Find all such integers.

x & $x+2$

$x^2 + (x+2)^2 = 74$

$x^2 + (x+2)(x+2) = 74$

$x^2 + x^2 + 2x + 2x + 4 - 74 = 0$

$2x^2 + 4x - 70 = 0$

Divide by 2 to reduce

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

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

by Z.F.P.

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

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

x	$x+2$
5	7
-7	-5

5 & 7 and -7 & -5

The product of two cons. even integers is 80.

Find all such even integers.

x & $x+2$

$x(x+2) = 80$

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

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

by Z.F.P.

$x+10=0$ $\quad$ $x-8=0$

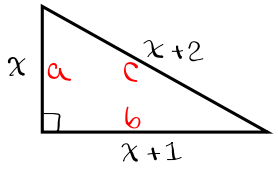
$x=-10$ $\quad$ $x=8$

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

$8 \& 10$ or $-10 \& -8$

3 Sides of a right triangle are 3 Consecutive integers.

Find all 3 Sides.



By Pythagorean thm

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

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

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

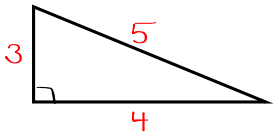
$x^2 + x^2 + x + x + 1 = x^2 + 2x + 2x + 4$

$x^2 + 1 - 2x - 4 = 0$

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

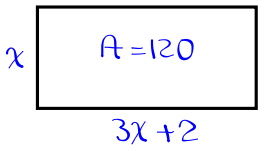
$(x-3)(x+1) = 0$

$x = 3$ $\quad$ ~~$x = -1$~~



The area of a rectangular room is $120\ m^2$. Its length is 2 meters longer than 3 times its width.

1) Draw & label clearly



2) Find its dimensions.

$x(3x+2)=120$

$3x^2+2x-120=0$

$a=3 \quad b=2 \quad c=-120$

$b^2-4ac=2^2-4(3)(-120)=4+1440=1444$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}=\frac{-2\pm\sqrt{1444}}{6}=\frac{-2\pm 38}{6}$$

$x=\frac{-2+38}{6}=\frac{36}{6}=6$

$x=\frac{-2-38}{6}=\frac{-40}{6}$