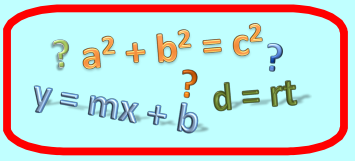
Math 115

Fall 2018

Lecture 27



Feb 19-8:47 AM

Simplify / Reduce:

① $\dfrac{5x+15}{x^2+6x+9}$

$= \dfrac{5(x+3)}{(x+3)(x+3)}$

$= \boxed{\dfrac{5}{x+3}}$

② $\dfrac{2x^2+3x-5}{3x^2+2x-5}$

$2x^2+3x-5$

$P = -10$, $S = 3$, -10

$5, -2$

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

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

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

$= \boxed{\dfrac{2x+5}{3x+5}}$

Find all excluded values: Deno. = 0, then Solve

① $\frac{x}{x-4}$

$x-4=0$

$\boxed{x=4}$

E.V. $\Rightarrow 4$

$\Rightarrow x \neq 4$

② $\frac{x-8}{4x+3}$

$4x+3=0$

$4x=-3$

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

E.V. $\Rightarrow \frac{-3}{4}$

$\Rightarrow x \neq \frac{-3}{4}$

③ $\frac{x^2-8x}{4x^2-13x-12}$

$4x^2-13x-12=0$

$a=4 \quad b=-13, \quad c=-12$

$b^2-4ac=(-13)^2-4(4)(-12)$

$=169+192$

$=361$

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}=\frac{-(-13)\pm\sqrt{361}}{2(4)}=\frac{13\pm 19}{8}$

$x=\frac{13+19}{8}=\frac{32}{8}=\boxed{4}$ $\qquad$ $x=\frac{13-19}{8}=\frac{-6}{8}=\boxed{\frac{-3}{4}}$

E.V. $\frac{-3}{4}, 4$

$x \neq \frac{-3}{4}, x \neq 4$

When b^2-4ac is a perfect-square, then ax^2+bx+c is factorable.

Find b^2-4ac for $4x^2-2x+7$.

$a=4$, $b=-2$, and $c=7$

$b^2-4ac=(-2)^2-4(4)(7)=4-112=-108$

Now Since $b^2-4ac=-108$ is <u>not</u> a Perfect-Square, then $4x^2-2x+7$ is <u>Not</u> factorable.

Simplify:

① $\frac{3x+9}{2x-10} \cdot \frac{x^2-3x-10}{x^2-9}$

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

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

② $\frac{2x+1}{x+5} \div \frac{6x^2-x-2}{x^2-25}$

$= \frac{2x+1}{x+5} \cdot \frac{x^2-25}{6x^2-x-2}$

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

$= \boxed{\frac{x-5}{3x-2}}$

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

$P = -12$, $S = -1$, -12, $3, -4$

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

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

Simplify:

1) $\frac{5}{3x} - \frac{2}{3x}$

$= \frac{5-2}{3x}$

$= \frac{3}{3x} = \frac{3 \cdot 1}{3x}$

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

2) $\frac{3}{x^2+4x+3} - \frac{1}{x^2-9}$

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

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

$= \frac{3x-9-x-1}{(x+3)(x+1)(x-3)} = \frac{2x-10}{(x+3)(x+1)(x-3)} = \frac{2(x-5)}{(x+3)(x+1)(x-3)}$

Simplify:

$$\frac{8}{x^2+6x} - \frac{3}{x^2+4x-12}$$

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

$$= \frac{8(x-2) - 3x}{x(x+6)(x-2)} = \frac{8x-16-3x}{x(x+6)(x-2)}$$

$$= \boxed{\frac{5x-16}{x(x+6)(x-2)}}$$

Use LCD to Reduce:

$$\frac{\frac{2}{3} - \frac{1}{6}}{\frac{1}{4} + \frac{2}{5}} = \frac{\cancel{60}^{20} \cdot \frac{2}{3} - \cancel{60}^{10} \cdot \frac{1}{\cancel{6}}}{\cancel{60}^{15} \cdot \frac{1}{\cancel{4}} + \cancel{60}^{12} \cdot \frac{2}{\cancel{5}}}$$

$3 = 3$

$6 = 3 \cdot 2$

$4 = 2 \cdot 2$

$5 = 5$

LCD $= 3 \cdot 2 \cdot 2 \cdot 5 = 60$

LCD $=$

$$= \frac{40 - 10}{15 + 24}$$

$$= \frac{30}{39} = \frac{3 \cdot 10}{3 \cdot 13} = \boxed{\frac{10}{13}}$$

Simplify by using LCD:

$$\frac{x - 10 + \frac{25}{x}}{x - \frac{25}{x}} = \frac{x^2 - 10x + 25}{x^2 - 25}$$

LCD = x

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

Solve

① $(x-5)(3x+2) = 0$

By Z.F.P.

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

$x = 5$ $\quad x = \frac{-2}{3}$

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

② $3x^2 - 13x = 10$

$3x^2 - 13x - 10 = 0$

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

See last example

$\left\{\frac{-2}{3}, 5\right\}$

Solve by using quadratic formula

$(3x+2)(x+1) = 24$.

Hint: Foil, simplify, then use quadratic formula.

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

$3x^2 + 5x - 22 = 0$

$a=3 \quad b=5 \quad c=-22$

$b^2-4ac = (5)^2 - 4(3)(-22) = 289$

* 289 is 17^2, it is a perfect-square.

It means we can solve by factoring.

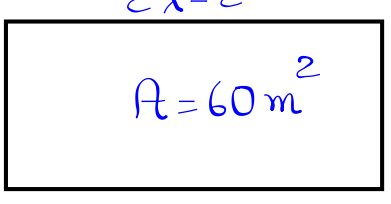
$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-5 \pm \sqrt{289}}{6} = \frac{-5 \pm 17}{6}$

$x = \frac{-5+17}{6} = \frac{12}{6} = \boxed{2}$

$x = \frac{-5-17}{6} = \frac{-22}{6} = \frac{-11}{3}$

$\left\{\frac{-11}{3}, 2\right\}$

Find the dimensions of



$A = 60$

$LW = 60$

$x(2x-2) = 60$

$2x^2 - 2x - 60 = 0$

Divide by 2 to reduce

$x^2 - x - 30 = 0$

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

▷ by Z.F.P.

$x-6=0 \quad x+5=0$

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

6m by 10m

One number is 4 more than another. Their product is 2 less than the smaller number. Find all such numbers.

x, $x+4$

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

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

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

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

$x = -2 \quad x = -1$

-2 & 2

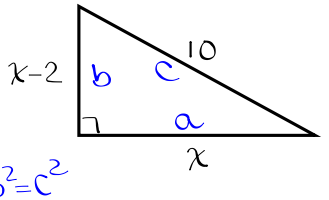
or

-1 & 3

One leg of a right triangle is 2m shorter than the other leg.

Hypotenuse is 10m.

Find both legs.



Right Triangle → $a^2 + b^2 = c^2$ → Pythagorean Thm

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

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

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

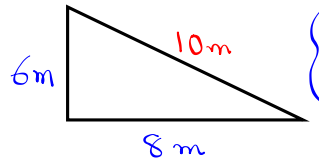
$2x^2 - 4x - 96 = 0$

Divide by 2 to reduce

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

$(x+6)(x-8) = 0$ by Z.F.P.

$x = -6 \quad x = 8$



legs are 6m & 8m.

Work on the next two Study Guides