

Section 6.4: Complex Fractions

Tuesday, November 12, 2013
8:43 AM

fractions within fractions

$$\frac{\frac{1}{3} + \frac{1}{4}}{\frac{1}{5} + \frac{1}{6}}$$

method #1: make single fraction of numerator denominator
invert & multiply

$$\frac{\frac{1}{3} + \frac{1}{4}}{\frac{1}{5} + \frac{1}{6}} = \frac{\frac{4}{12} + \frac{3}{12}}{\frac{6}{30} + \frac{5}{30}} = \frac{\frac{7}{12}}{\frac{11}{30}} = \frac{7}{12} \cdot \frac{30}{11} = \frac{35}{22}$$

method #2: multiply top & bottom by LCD

$$\frac{\frac{1}{3} + \frac{1}{4}}{\frac{1}{5} + \frac{1}{6}} \frac{60}{60} = \frac{20 + 15}{12 + 10} = \frac{35}{22}$$

examples: simplify:

$$\frac{m - \frac{2}{n}}{\frac{1}{m} - \frac{3}{n}}$$

method #1 :

$$\frac{\frac{mn}{n} - \frac{2}{n}}{\frac{n}{mn} - \frac{3m}{mn}}$$

$$\frac{\frac{mn-2}{n}}{\frac{n-3m}{mn}}$$

$$\frac{mn-2}{\cancel{n}} \cdot \frac{\cancel{mn}}{n-3m}$$

$$\boxed{\frac{m(mn-2)}{n-3m} \quad \text{or} \quad \frac{m^2n-2m}{n-3m}}$$

$$\frac{m - \frac{2}{n}}{\frac{1}{m} - \frac{3}{n}} \cdot \frac{mn}{mn} = \frac{m^2n - 2m}{n - 3m}$$

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

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

method #1 $\frac{\left(\frac{2-x}{2-x}\right)3}{2+x} - \frac{4}{2-x} \left(\frac{2+x}{2+x}\right)$

← LCD:
 $(2+x)(2-x)$

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

← LCD:
 $(x+2)(x-2)$

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

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

$$\frac{6-3x-8-4x}{(2-x)(2+x)}$$

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

$$\frac{-7x-2}{(2-x)(2+x)}$$

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

$$-1 \cdot \frac{-7x-2}{(2-x)(2+x)} \cdot \frac{(x+2)(x-2)}{-2x-8}$$

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

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

$$\frac{x-2}{-(x-2)}$$

$$\frac{7x+2}{-2x-8} \quad \text{or} \quad \frac{-7x-2}{2x+8} \quad \text{or} \quad -\frac{7x+2}{2x+8} \quad \text{or} \quad -\frac{7x+2}{2(x+4)}$$

method #2:

$$2-x = -(x-2)$$

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

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

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

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

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

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

$$= \frac{7x+2}{-2x-8}$$

$$\frac{a^{-1} - b^{-1}}{a^{-1} + b^{-1}} = \frac{\frac{1}{a} - \frac{1}{b}}{\frac{1}{a} + \frac{1}{b}}$$

method #1:

$$= \frac{\frac{b}{ab} - \frac{a}{ab}}{\frac{b}{ab} + \frac{a}{ab}}$$

$$= \frac{\frac{b-a}{ab}}{\frac{b+a}{ab}}$$

$$= \frac{b-a}{\cancel{ab}} \cdot \frac{\cancel{ab}}{b+a}$$

$$= \frac{b-a}{b+a}$$

method #2

$$\frac{\frac{1}{a} - \frac{1}{b}}{\frac{1}{a} + \frac{1}{b}} \quad \frac{ab}{ab}$$

$$\frac{b-a}{b+a}$$

$$\begin{aligned} \frac{a + 27a^{-2}}{1 - 3a^{-1} + 9a^{-2}} &= \frac{a + \frac{27}{a^2}}{1 - \frac{3}{a} + \frac{9}{a^2}} \quad a^2/a^2 \\ &= \frac{a^3 + 27}{a^2 - 3a + 9} \\ &= \frac{(a+3)(\cancel{a^2 - 3a + 9})}{\cancel{a^2 - 3a + 9}} \\ &= a+3 \end{aligned}$$