

1. For each problem below, determine whether or not the solution is true or false. If it is false, correct it:

a.  ~~$2x+1 \left( \frac{12x^3+20x^2+23x+9}{2x+1} = 6x^2+7x+8 \right) \circ 2x+1$~~

$$12x^3+20x^2+23x+9 = (6x^2+7x+8)(2x+1)$$

b.  ~~$x+2 \left( \frac{3x}{x+2} + \frac{6}{x+2} = 3 \right) \circ x+2$~~  **No**  $12x^3+6x^2+14x+7+16x+8 = 12x^3+6x^2+30x+15$

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

$$3x+6 = 3x+6$$

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

c.  $\left( \frac{x+1}{x+1} \right) \frac{x}{x-1} - \frac{1}{x+1} \frac{x-1}{x-1}$  **Yes**

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

**No** But, ~~it's not~~ it's close.

d.  ~~$\frac{x+6}{x-2} \left( \frac{2(x-2)}{(x+5)} = 2(x-2)(x+5) \right)$~~

**No**  
 $\frac{2(x-2)}{x+5} \neq 2(x-2)(x+5)$

2. Solve each equation for x. Show all of your work and **check your answers**.

a.  $\frac{3x}{x-5} + \frac{2}{x-5} = \frac{-13}{x-5}$

b.  $\frac{5}{2x-2} - \frac{x}{x-1} = \frac{5}{2}$

~~$x-5 \left( \frac{3x+2}{x-5} = \frac{-13}{x-5} \right) x-5$~~

$$3x+2 = -13$$

$$-2 \quad -2$$

$$3x = -15$$

**$x = -5$**

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

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

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

$$5-2x = 5x-5$$

c.  $\left( \frac{x-3}{x-3} \right) \frac{5}{x+3} + \frac{2}{(x+3)(x-3)} = \frac{4}{x-3} \frac{x+3}{x+3}$

$$(x-3)(x+3) \left( \frac{5x-15}{(x-3)(x+3)} + \frac{2}{(x+3)(x-3)} \right) = \frac{4x+12}{(x-3)(x+3)}$$

$$5x-15+2 = 4x+12$$

$$5x-13 = 4x+12$$

$$+13 \quad +13$$

$$5x = 4x+25$$

$$-4x \quad -4x$$

**$x = 25$**

d.  $\left( \frac{x-4}{x-4} \right) \frac{3}{x-1} - \frac{12}{x-4} = \frac{5-6}{x^2-5x+4}$

$$\frac{3x-12}{(x-4)(x-1)} - \frac{2x-2}{(x-4)(x-1)} = \frac{-6}{(x-4)(x-1)}$$

$$\frac{x-10}{(x-4)(x-1)} = \frac{-6}{(x-4)(x-1)}$$

$$x-10 = -6$$

$$+10 \quad +10$$

**$x = 4$**

$5 = 2x - 5$   
 $+5 \quad +5$   
 $10 = 2x$   
 $\frac{10}{2} = \frac{2x}{2}$   
 $5 = x$

3. a. Show that  $\frac{1}{x} - \frac{1}{x+1} = \frac{1}{x(x+1)}$

$$\begin{aligned} \left(\frac{x+1}{x+1}\right) \frac{1}{x} - \frac{1 \cdot x}{x+1 \cdot x} &= \frac{x+1}{x(x+1)} - \frac{x}{x(x+1)} \\ &= \frac{1}{x(x+1)} \end{aligned}$$

b. Show that  $\frac{2}{x} - \frac{2}{x+2} = \frac{4}{x(x+2)}$

$$\begin{aligned} \left(\frac{x+2}{x+2}\right) \frac{2}{x} - \frac{2}{x+2} \left(\frac{x}{x}\right) &= \frac{2x+4}{x(x+2)} - \frac{2x}{x(x+2)} \\ &= \frac{4}{x(x+2)} \end{aligned}$$

c. Make a conjecture for  $\frac{10}{x} - \frac{10}{x+10} = ?$

$$= \frac{100}{x(x+10)}$$

d. Hence what is  $\frac{b}{x} - \frac{b}{x+b} = ?$  For any number  $b$ .

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