

009 ~~5.5~~ 1.5, 9, ..., 43

$$\textcircled{1} \quad \frac{x}{5} + 4 = \frac{5}{3}$$

$$\text{LCD} = 3 \cdot 5$$

$$\frac{x}{5} \cdot \frac{3}{3} + \frac{4}{1} \cdot \frac{3 \cdot 5}{3 \cdot 5} = \frac{5}{3} \cdot \frac{5}{5}$$

$$\frac{3x + 60}{\text{LCD}} = \frac{25}{\text{LCD}}$$

$$3x + 60 = 25$$

$$3x = -35$$

$$x = -\frac{35}{3}$$

Throw away LCD

In the sequel, when you're asked to solve INEQUALITIES, you won't be able to throw away the LCD if there are  $x$ 's in the denominator.

$$\textcircled{5} \quad \frac{y}{2} + \frac{y}{4} + \frac{y}{6} = 3$$

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

$$\frac{y}{2} \cdot \frac{2 \cdot 3}{2 \cdot 3} + \frac{y}{2 \cdot 2} \cdot \frac{3}{3} + \frac{y}{2 \cdot 3} \cdot \frac{2}{2} = \frac{3}{1} \cdot \frac{2 \cdot 2 \cdot 3}{2 \cdot 2 \cdot 3}$$

$$\frac{6y + 3y + 2y}{\text{LCD}} = \frac{36}{\text{LCD}}$$

$$\frac{11y}{\text{LCD}} = \frac{36}{\text{LCD}}$$

$$11y = 36$$

$$y = \frac{36}{11}$$

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$$\textcircled{9} \quad \frac{1}{x} - \frac{1}{3} = \frac{2}{3x} \quad \text{LCD} = 3x$$

$$\frac{1}{x} \cdot \frac{3}{3} - \frac{1}{3} \cdot \frac{x}{x} = \frac{2}{3x}$$

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

$$3-x=2$$

$$-x=-1$$

$$\boxed{x=1}$$

$$\textcircled{13} \quad 1 - \frac{1}{x} = \frac{12}{x^2} \quad \text{LCD} = x^2$$

$$\frac{1}{1} \cdot \frac{x^2}{x^2} - \frac{1}{x} \cdot \frac{x}{x} = \frac{12}{x^2}$$

$$\frac{x^2-x}{\text{LCD}} = \frac{12}{\text{LCD}}$$

$$x^2-x=12$$

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

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

$$x-4=0 \text{ OR } x+3=0$$

$$\boxed{x=4 \text{ OR } x=-3}$$

099 85.545 17, 21, my 43

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

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

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

$$x+2 = 1+2x+2$$

$$x+2 = 2x+3$$

$$-x = 1$$

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

(21)  $6 - \frac{5}{x^2} = \frac{7}{x}$

$$\frac{6}{1} \cdot \frac{x^2}{x^2} - \frac{5}{x^2} = \left(\frac{7}{x}\right)\left(\frac{x}{x}\right)$$

$$\frac{6x^2 - 5}{\text{LCD}} = \frac{7x}{\text{LCD}}$$

$$6x^2 - 5 = 7x$$

$$6x^2 - 7x - 5 = 0$$

$$6x^2 - 10x + 3x - 5 = 0$$

$$2x(3x-5) + 1(3x-5) = 0$$

$$(3x-5)(2x+1) = 0$$

$$3x-5=0 \text{ OR } 2x+1=0$$

$$3x=5$$

$$2x=-1$$

$$\boxed{x = \frac{5}{3} \text{ OR } x = -\frac{1}{2}}$$

$(6)(-5) = -\underbrace{(2)(3)(5)}_{-10+3}$  want sum of  $-7$

099 § 8.5 #s 25, 29, m, 43

(25)  $\frac{2}{x-3} + \frac{x}{x^2-9} = \frac{4}{x+3}$

$x^2-9 = (x+3)(x-3) = \text{LCD}$

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

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

$2x + 6 + x = 4x - 12$

$3x + 6 = 4x - 12$

$-x = -18$

$x = 18$

$t^2 - 3t = t(t-3)$

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

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

(29)  $\frac{t-4}{t^2-3t} = \frac{-2}{t^2-9}$

$\left(\frac{t-4}{t(t-3)}\right)\left(\frac{t+3}{t+3}\right) = \left(\frac{-2}{(t+3)(t-3)}\right)\left(\frac{t}{t}\right)$

$\frac{(t-4)(t+3)}{\text{LCD}} = \frac{-2t}{\text{LCD}}$

Check:  
 $t = -4$

$\frac{-4-4}{(-4)^2-3(-4)} \stackrel{?}{=} \frac{-2}{(-4)^2-9}$

$t^2 - t - 12 = -2t$

$t^2 + t - 12 = 0$

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

NOTE:  
 $t = 3 \notin \text{Domain!}$

$\frac{-8}{16+12} = \frac{-2}{16-9}$

$\frac{-8}{28} = \frac{-2}{7}$

$-\frac{2}{7} = -\frac{2}{7}?$

Yes

$t = -4, 3$

$t = -4$

Extraneous!  
Throw it out!

099 of 5.5 #3 33, 37, 41, 43

(33)  $\frac{2}{a+1} = \frac{3}{1-a} + \frac{5}{a}$  LCD =  $a(a-1)(a+1)$

$$\frac{2}{a+1} = \frac{-3}{a-1} + \frac{5}{a}$$

$$\left(\frac{2}{a+1}\right)\left(\frac{a(a-1)}{a(a-1)}\right) = \left(\frac{-3}{a-1}\right)\left(\frac{a(a+1)}{a(a+1)}\right) + \left(\frac{5}{a}\right)\left(\frac{(a-1)(a+1)}{(a-1)(a+1)}\right)$$

$$\frac{2a(a-1)}{LCD} = \frac{-3(a(a+1)) + 5(a-1)(a+1)}{LCD}$$

$$2a^2 - 2a = -3a(a+1) + 5(a^2 - 1)$$

$$2a^2 - 2a = -3a^2 - 3a + 5a^2 - 5$$

$$2a^2 - 2a = 2a^2 - 3a - 5$$

$$a = -5$$

$$y^2 - y = y(y-1)$$

$$y^2 - 1 = (y-1)(y+1)$$

$$LCD = y(y-1)(y+1)$$

(37)  $\frac{y+2}{y^2-y} - \frac{6}{y^2-1} = 0$

$$\left(\frac{y+2}{y(y-1)}\right)\left(\frac{y+1}{y+1}\right) - \left(\frac{6}{(y-1)(y+1)}\right)\left(\frac{y}{y}\right) = 0$$

$$\frac{(y+2)(y+1) - 6y}{LCD} = 0 \Rightarrow y^2 + 3y + 2 - 6y = 0$$

$$y^2 - 3y + 2 = 0$$

$$(y-2)(y-1) = 0$$

$$y = 1, 2$$

$$y = 2$$

→  $\notin \mathbb{Q}$

check

$$\frac{2+2}{2^2-2} - \frac{6}{2^2-1} \stackrel{?}{=} 0$$

$$\frac{4}{2} - \frac{6}{3} = 0$$

$$2 - 2 = 0 \quad \checkmark$$

099  $\int 8.5$  ~~45~~ 41, 43

$$(41) \frac{2}{y^2-7y+12} - \frac{1}{y^2-9} = \frac{4}{y^2-y-12}$$

$$y^2-7y+12 = (y-3)(y-4)$$

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

$$y^2-y-12 = (y-4)(y+3)$$

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

$$\left( \frac{2}{(y-3)(y-4)} \right) \left( \frac{y+3}{y+3} \right) - \left( \frac{1}{(y-3)(y+3)} \right) \left( \frac{y-4}{y-4} \right) = \left( \frac{4}{(y-4)(y+3)} \right) \left( \frac{y-3}{y-3} \right)$$

$$\frac{2(y+3) - 1(y-4)}{\text{LCD}} = \frac{4(y-3)}{\text{LCD}}$$

$$2y+6 - y + 4 = 4y - 12$$

$$y+10 = 4y-12$$

$$-3y = -22$$

$$y = \frac{22}{3}$$

(43)  $f(x) = \frac{1}{x-3}$ ,  $g(x) = \frac{1}{x+3}$  Find  $x$  if

(a)  $f(x) + g(x) = \frac{5}{8}$

$LCD = 8(x-3)(x+3)$

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

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

$$8(x+3) + 8(x-3) = 5(x^2-9)$$

$$8x + 24 + 8x - 24 = 5x^2 - 45$$

$$-5x^2 + 16x + 45 = 0$$

$$5x^2 - 16x - 45 = 0$$

$$5x^2 - 25x + 9x - 45 = 0$$

$$5x(x-5) + 9(x-5) = 0$$

$$(x-5)(5x+9) = 0$$

$x = 5 \text{ OR } x = -\frac{9}{5}$

$$(5)(-45)$$

$$= -\frac{(5)(3)(3)(5)}{\boxed{25}}$$

Sledgehammer  $\Delta 9$

is fine.  $-25 + 9 = -16$  ✓

Both check.