§1.1

*1-8 - The student should write these out, to master the terms

*9-12 Determine whether the number is a solution to the equation following it.

(9) 3, $2x-4=9$

Check:

$2(3)-4=6-4=-2 \neq 9$

No

(10) -2, $\frac{1}{x}-\frac{1}{2}=-1$

Check:

$\frac{1}{-2}-\frac{1}{2}=-\frac{1}{2}-\frac{1}{2}=-1$

Yes

*13-26 Solve each equation and check your answer.

(13) $3x-5=0$

$3x=5$

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

$x \in \{\frac{5}{3}\}$ is the "solution set answer/statement.

(17) $8x-9=1-6x$

$+6x \quad +9 = \quad +6x+9$

$14x=10$

$x=\frac{10}{14}=\frac{5}{7}=x$

$x \in \{\frac{5}{7}\}$

121 §1.1

(23) $\frac{x}{2} - 5 = -12 - \frac{2x}{3}$

LCD $= 2 \cdot 3 = 6$

$\frac{x}{2} \cdot \frac{3}{3} - \frac{5}{1} \cdot \frac{6}{6} = -\frac{12}{1} \cdot \frac{6}{6} - \frac{2x}{3} \cdot \frac{2}{2}$

$\frac{3x-30}{LCD} = \frac{-72-4x}{LCD}$

$3x - 30 = -72 - 4x$

$7x = 42$

$x = \frac{42}{7} = 6$

$x \in \{6\}$

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

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

$2 = 2$
$3 = 3$
$4 = 2 \cdot 2$
$6 = 2 \cdot 3$

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

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

$18x + 4 = 3x - 2$

$15x = -6$

$x = -\frac{6}{15} = -\frac{2}{5}$

$x \in \{-\frac{2}{5}\}$

121 §1.1

#s37-48 solve & ident'fy each equation as conditional, inconsistent or identity.

(27) $3(x-6) = 3x-18$

$3x-18 = 3x-18$ (IDENT) See it here.

$+18 = +18$

$3x = 3x$

$\frac{3x}{3} = \frac{3x}{3}$ $\{x \mid x \text{ is real}\}$

$x = x$

$-x = -x$

$0 = 0$ Identity

Totally confirmed here

(28) $2a+3a = 6a$

$5a = 6a$

$-6a = -6a$

$-a = 0$

$a = 0$

$a \in \{0\}$

Conditional

(33) $3(x-6) = 3x+18$

$3x-18 = 3x+18$

$+18 = +18$

$3x = 3x+36$

$-3x = -3x$

$0 = 36$!?

Inconsistent

#s 37-48 Solve each equation involving rational expressions. Ident.fy each as conditional, identity, or inconsistent.

#21 §1.1

(37) $\frac{1}{w-1} - \frac{1}{2w-2} = \frac{1}{2w-2}$ LCD = $2(w-1)$

$\frac{1}{2(w-1)} \quad \frac{1}{2(w-1)}$

Domain: can't let $w-1$ or $2w-2$ equal zero!

$\frac{1}{w-1} \cdot \frac{2}{2} - \frac{1}{2(w-1)} = \frac{1}{2(w-1)}$

$\frac{2-1}{LCD} = \frac{1}{LCD}$

$\frac{1}{LCD} = \frac{1}{LCD}$

$1 = 1$ (Identity)

Solution:

$w \in \{x \mid x \neq 1\}$ (works for all w in the domain.)

121 §4.1

(38) $\frac{1}{x} + \frac{1}{x-3} = \frac{9}{x^2-3x}$

LCD: $x(x-3)$

Domain:

$x \neq 0$

$x-3 \neq 0$

$x \neq 3$

$\{x \mid x \neq 0 \text{ and } x \neq 3\}$

$= (-\infty, 0) \cup (0, 3) \cup (3, \infty)$

$x(x-3)$

$\frac{1}{x} \cdot \frac{(x-3)}{(x-3)} + \frac{1}{x-3} \cdot \frac{x}{x} = \frac{9}{x(x-3)}$

$\frac{x-3+x}{LCD} = \frac{9}{LCD}$

$2x-3 = 9$

$2x = 12$

$x = 6$, i.e., $x \in \{6\}$

Conditional

CHECK!

$\frac{1}{6} + \frac{1}{6-3} \stackrel{?}{=} \frac{9}{6^2-3(6)}$

$\frac{1}{6} + \frac{1}{3} = \frac{9}{36-18} = \frac{9}{18} = \frac{1}{2}$

$\frac{1}{6} + \frac{2}{6} = \frac{1}{2}$

$\frac{3}{6} = \frac{1}{2}$ ✓

(42) $\frac{2x-3}{x-4} = \frac{5}{x-4}$ LCD: $x-4$

$\frac{2x-3}{LCD} = \frac{5}{LCD}$ Domain: $\{x \mid x \neq 4\}$

$2x-3 = 5$

$2x = 8$

$x = 4$, but $x = 4 \notin$ Domain!

No Solution! $\emptyset = \{\}$ = Empty solution set.

Inconsistent

121 § 1.1

#s 49-62 Use a calculator. Round each approximate answer to three decimal places.

TEACHER NOTES: Save Rounding until the end!

(49) $.27a - 3.9 = .48x + .29$

$-.48a + 3.9 = -.48a + 3.9$

$.21a = 4.19$

$a = \frac{4.19}{.21} \approx 19.952381 \approx \boxed{19.952}$

$x \in \{19.952\}$

(53) $2a + 1 = -\sqrt{17}$

$2a = -1 - \sqrt{17}$

$a = \frac{-1-\sqrt{17}}{2} \approx -2.561552813$

$\approx \boxed{-2.562}$

$a \in \{-2.562\}$

121 §1.1

(55) $\dfrac{.001}{y-.333} = 3$ LCD = $y-.333$

$\dfrac{.001}{y-.333} = \dfrac{3}{1}\left(\dfrac{y-.333}{y-.333}\right)$

$\dfrac{.001}{LCD} = \dfrac{3y-.999}{LCD}$

$.001 = 3y-.999$

$3y-.999 = .001$ (I'm right-handed!)

$3y = 1$

$\boxed{y = \frac{1}{3}}$ ⇒ EXACT. No rounding needed.

Calculator to 9 places is $y \approx .333$

But if THAT'S exact, and OK, what's wrong with #49, with just doing

$a = \dfrac{4.19}{.21} = \dfrac{419}{21}$, which is ALSO exact!

I HATE these math guys' imprecision, leading to ambiguities & hurting learning!

(62) $(-3.4\times10^{-9})y + (3.45\times10^{-8}) = 1.63\times10^{4}$

$(-3.4\times10^{-9})y = \underbrace{1.63\times10^{4}}_{\text{BIG!}} - \underbrace{3.45\times10^{-8}}_{\text{SMALL! Insignificant! (could have ignored it!)}}$

$$y = \frac{1.63\times10^{4} - 3.45\times10^{-8}}{-3.4\times10^{-9}} \approx -4.794117647\times10^{12}$$

$\approx \boxed{-4.794\times10^{12}}$ "y is"

$y \in \{-4.794\times10^{12}\}$ "y belongs to"

\#s 63-80 Solve Absolute Value Equations

(63) $|x| = 8$

$x = 8$ OR $x = -8$

$\boxed{x \in \{-8, 8\}}$

(65) $|x-4| = 8$

$x-4 = 8$ OR $x-4 = -8$

$x = 12$ OR $x = -4$

$\boxed{x \in \{-4, 12\}}$

121 §1.1

(73) $\frac{1}{2}|x-9| = 16$ LCD: 2

$$\frac{|x-9|}{2} = \frac{16}{1}\cdot\frac{2}{2}$$

$$\frac{|x-9|}{LCD} = \frac{32}{LCD}$$

$$|x-9| = 32$$

$x-9=32$ or $x-9=-32$

$x=41$ or $x=-23$

$\boxed{x \in \{-23, 41\}}$

(78) $5|6-3x| = 0$

$$|6-3x| = 0$$

$6-3x = \pm 0 = 0$, of course!

$-3x = -6$

$x = 2$

$\boxed{x \in \{2\}}$

121 §1.1 #s 81 - 104 Solve each equation

(85) $(x+2)^2 = x^2+4$

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

$4x+4 = 4$

$4x = 0$

$x = 0$

$\boxed{x \in \{0\}}$

(88) $(3x-4)^2 + (4x+1)^2 = (5x+2)^2$

$(3x)^2 + (2)(3x)(-4) + (-4)^2 + (4x)^2 + 2(4x)(1) + 1^2$

$= (5x)^2 + 2(5x)(2) + 2^2 \longrightarrow$

$9x^2 - 24x + 16 + 16x^2 + 8x + 1 = 25x^2 + 20x + 4 \longrightarrow$

$25x^2 - 16x + 17 = 25x^2 + 20x + 4 \longrightarrow$

$-16x + 17 = 20x + 4$

$-36x = -13$

$x = \frac{-13}{-36} = \frac{13}{36}$

$\boxed{x \in \left\{\frac{13}{36}\right\}}$

(94) $9 - |2x-3| = 6$

$-|2x-3| = -3$

$|2x-3| = 3$

$2x-3 = 3$ OR $2x-3 = -3$

$2x = 6$ OR $2x = 0$

$x = \frac{6}{2} = 3$ OR $x = \frac{0}{2} = 0$

$\boxed{x \in \{0, 3\}}$

(96) $-7 - |3x+1| = |3x+1| - 7$

$-|3x+1| = |3x+1|$

$-2|3x+1| = 0$

$|3x+1| = 0$

$3x+1 = \pm 0 = 0$

$3x = -1$

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

$\boxed{x \in \{-\frac{1}{3}\}}$

** Treating $|3x+1|$ as a single entity

$-|3x+1| - |3x+1|$

$= -2|3x+1|$

121 §1.1

(101) Good one for handling a negative denominator.

$$\frac{4}{x+3} - \frac{3}{2-x} = \frac{7x+1}{x^2+x-6}$$

I'd INSTANTLY re-write as follows:

$$\frac{4}{x+3} + \frac{3}{x-2} = \frac{7x+1}{x^2+x-6}$$

$$\frac{7x+1}{(x+3)(x-2)}$$

LCD: $(x+3)(x-2)$

Domain: $\{x \mid x \neq 2 \text{ and } x \neq -3\}$

$$\frac{4}{x+3}\cdot\left(\frac{x-2}{x-2}\right) + \left(\frac{3}{x-2}\right)\left(\frac{x+3}{x+3}\right) = \frac{7x+1}{LCD}$$

$$\frac{4x-8+3x+9}{LCD} = \frac{7x+1}{LCD}$$

$7x+1 = 7x+1$ Identity!

Always true if x is legal (in domain)

$\{x \mid x \neq 2 \text{ and } x \neq -3\} = (-\infty,-3)\cup(-3,2)\cup(2,\infty)$

Anybody know how to do #111?