

099 $\Sigma 2.5$ #5 1-65

Ⓐ Solve the absolute value equations

Ⓛ $|x| = 4$

$\{x \mid x=4 \text{ OR } x=-4\}$

$x \in \{ \pm 4 \}$

ⓓ $|x| = 7$

$x \in \{ \pm 7 \}$

Ⓜ $|x| = -3$ \emptyset

Never!

Ⓝ $|z| + 2 = 3$

$|z| = 1$

$z \in \{ \pm 1 \}$

Ⓟ $|y| + 4 = 3$

~~$|y| = -1$~~ \emptyset

Ⓡ $|z-4| = \frac{5}{3}$

$\frac{3|z-4|}{3} = \frac{5}{3}$

$|3z-12| = 5$

$3z-12=5$ OR $3z-12=-5$

$3z=17$ OR $3z=7$

$z = \frac{17}{3}$ OR $z = \frac{7}{3}$

$z \in \left\{ \frac{7}{3}, \frac{17}{3} \right\}$

099 $5'25 \neq 5$ 13-65

$$(13) \left| \frac{3a}{5} + \frac{1}{2} \right| = 1$$

$$\text{LCD} = 2 \cdot 5$$

$$\left| \frac{3a}{5} \cdot \frac{2}{2} + \frac{1}{2} \cdot \frac{5}{5} \right| = \frac{1}{1} \cdot \frac{10}{10}$$

$$\left| \frac{6a+5}{10} \right| = \frac{10}{10}$$

$$|6a+5| = 10$$

$$6a+5=10 \quad \text{OR} \quad 6a+5=-10$$

$$6a=5$$

$$6a=-15$$

$$a = \frac{5}{6} \quad \text{OR} \quad a = -\frac{15}{6}$$

$$a \in \left\{ -\frac{15}{6}, \frac{5}{6} \right\}$$

$$(15) |20x-40| = 60$$

$$|2x-4| = 6$$

$$|x-2| = 3$$

$$x-2=3 \quad \text{OR} \quad x-2=-3$$

$$x=5 \quad \text{OR} \quad x=-1$$

$$x \in \{-1, 5\}$$

$$(17) |2x+1| = -3$$

~~_____~~
 \emptyset

$$(19) \left| \frac{3}{4}x - 6 \right| = 9$$

$$\left| \frac{3x}{4} - \frac{6}{1} \cdot \frac{4}{4} \right| = \frac{9}{1} \cdot \frac{4}{4}$$

$$\left| \frac{3x-24}{4} \right| = \frac{36}{4}$$

$$|3x-24| = 36$$

$$3x-24=36 \quad \text{OR} \quad 3x-24=-36$$

$$3x=60 \quad \text{OR} \quad 3x=-12$$

$$x \in \{20, -4\}$$

099 5'25 #s 21-65

(21) $|1 - \frac{1}{2}a| = 3$

$$\left| \frac{2-a}{2} \right| = \frac{6}{2}$$

$$|2-a| = 6$$

$$2-a=6 \text{ OR } 2-a=-6$$

$$-a=4 \text{ OR } -a=-8$$

$$a \in \{-4, 8\}$$

(23) $|2x-5| = 3$

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

$$2x=8 \text{ OR } 2x=2$$

$$x \in \{1, 4\}$$

NOTES $|4-7x| =$
 $|7x-4|$!

(25) $|4-7x| = 5$

$$4-7x=5 \text{ OR } 4-7x=-5$$

$$-7x=1 \text{ OR } -7x=-9$$

$$x \in \left\{ -\frac{1}{7}, \frac{9}{7} \right\}$$

$$|7x-4| = 5$$

$$7x-4=5 \text{ OR } 7x-4=-5$$

$$7x=9 \text{ OR } 7x=-1$$

$$x = \frac{9}{7} \text{ OR } x = -\frac{1}{7}$$

(27) $|3 - \frac{2}{3}y| = 5$

$$\left| \frac{2}{3}y - 3 \right| = 5$$

$$|2y-9| = 15$$

$$2y-9=15 \text{ OR } 2y-9=-15$$

$$2y=24 \text{ OR } 2y=-6$$

$$y=12 \text{ OR } y=-3$$

$$y \in \{-3, 12\}$$

699 § 2.5 #5 29-65

$$(29) \quad |3x+4|+1=7$$

$$|3x+4|=6$$

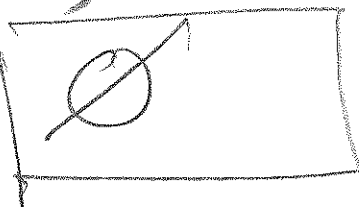
$$3x+4=6 \text{ OR } 3x+4=-6$$

$$3x=2 \text{ OR } 3x=-10$$

$$x \in \left\{ \frac{2}{3}, -\frac{10}{3} \right\}$$

$$(31) \quad |3-2y|+4=3$$

$$|2y-3|=-1$$



$$099 \text{ of } 2. \text{ } \cancel{4333-65}$$

$$(33) \quad 3 + |4t-1| = 8$$

$$|4t-1| = 5$$

$$4t-1=5 \quad \text{OR} \quad 4t-1=-5$$

$$4t=6 \quad 4t=-4$$

$$t = \frac{6}{4} = \frac{3}{2} \quad t = -\frac{4}{4} = -1$$

$$t \in \left\{ -1, \frac{3}{2} \right\}$$

$$(35) \quad |9 - \frac{3}{5}x| + 6 = 12$$

$$|9 - \frac{3}{5}x| = 6$$

$$|45 - 3x| = 30$$

$$45 - 3x = \pm 30$$

$$-3x = -45 \pm 30$$

$$x = \frac{-45 \pm 30}{-3}$$

$$\rightarrow \frac{-15}{-3} = 5$$

$$\downarrow \frac{-75}{-3} = 25$$

$$x \in \{5, 25\}$$

$$(37) \quad 5 = \left| \frac{2}{7}x + \frac{4}{7} \right| - 3$$

$$\left| \frac{2}{7}x + \frac{4}{7} \right| = 8$$

$$\left| \frac{2x}{7} + \frac{4}{7} \right| = \frac{8}{1} \cdot \frac{7}{7}$$

$$\left| \frac{2x+4}{\text{LCD}} \right| = \frac{56}{\text{LCD}}$$

$$|2x+4| = 56$$

$$2x+4=56 \quad \text{OR} \quad 2x+4=-56$$

$$2x=52$$

$$2x=-60$$

$$x=26$$

$$x=-30$$

$$x \in \{-30, 26\}$$

(OR $2x+4 = \pm 56$, etc.)

$$099 \quad |2.5 + 541 - 65| = 500$$

$$(41) \quad |3(x+1)| - 4 = -1$$

$$|3x+3| = 3$$

$$|x+1| = 1$$

$$x+1 = \pm 1$$

$$x = -1 \pm 1 \begin{matrix} \nearrow 0 \\ \searrow -2 \end{matrix}$$

$$x \in \{-2, 0\}$$

$$(43) \quad |1 + 3(2x-1)| = 5$$

$$|1 + 6x - 3| = 5$$

$$|6x-2| = 5$$

$$6x-2=5 \quad \text{OR} \quad 6x-2=-5$$

$$6x=7$$

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

$$6x=-3$$

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

$$x \in \left\{-\frac{1}{2}, \frac{7}{6}\right\}$$

$$(45) \quad 3 = -2 + |5 - \frac{2}{3}a|$$

$$|5 - \frac{2}{3}a| = 5$$

$$\left| \frac{5 \cdot \frac{3}{3} - 2a}{3} \right| = \frac{5 \cdot \frac{3}{3}}{3}$$

$$\left| \frac{15 - 2a}{LCD} \right| = \frac{15}{LCD}$$

$$|-2a+15| = 15$$

$$-2a+15 = \pm 15$$

$$-2a = -15 \pm 15$$

$$a = \frac{-15 \pm 15}{-2}$$

$$\begin{matrix} \nearrow \frac{0}{-2} \\ \searrow \frac{-30}{-2} = 15 \end{matrix}$$

$$a \in \{0, 15\}$$

099 §2.0 #5 47-65

$$(47) 6 = |7(k+3) - 4| = 6$$

$$|7k + 21 - 4| = 6$$

$$|7k + 17| = 6$$

$$7k + 17 = 6 \quad \text{OR} \quad 7k + 17 = -6$$

$$7k = -11 \quad \text{OR} \quad 7k = -23$$

$$k = -\frac{11}{7} \quad \text{OR} \quad k = -\frac{23}{7}$$

$$k \in \left\{ -\frac{23}{7}, -\frac{11}{7} \right\}$$

(49) #5 49-66 Solve the following equations

$$(1) |3a+1| = |2a-4|$$

$$3a+1 = |2a-4| \quad \text{OR} \quad 3a+1 = -|2a-4|$$

$$|2a-4| = 3a+1$$

$$2a-4 = 3a+1 \quad \text{OR} \quad 2a-4 = -3a-1$$

$$-|2a-4| = 3a+1$$

$$|2a-4| = -3a-1$$

$$2a-4 = -3a-1 \quad \text{OR} \quad 2a-4 = +3a+1$$

So, it boils down to

$$(2) 3a+1 = 2a-4 \quad \text{OR} \quad 3a+1 = -2a+4$$

$$a = -5$$

$$5a = 3$$

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

$$a \in \left\{ -5, \frac{3}{5} \right\}$$

099 $\int 2.54 \# 5 51-65$

(51) $|x - \frac{1}{3}| = |\frac{1}{2}x + \frac{1}{6}|$ LCD = 6 = 2 · 3

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

$$|\frac{6x-2}{LCD}| = |\frac{3x+1}{LCD}|$$

$$|6x-2| = |3x+1|$$

$$6x-2 = 3x+1 \quad \text{OR} \quad 6x-2 = -3x-1$$

$$3x = 3$$

$$9x = 1$$

$$x = 1$$

OR

$$x = \frac{1}{9}$$

$$x \in \left\{ \frac{1}{9}, 1 \right\}$$

(53) $|x-2| = |x+3|$

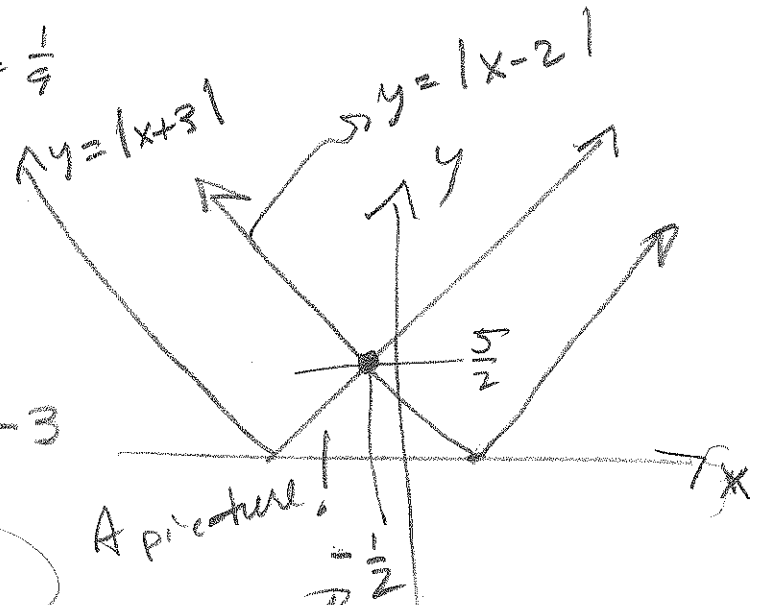
$$x-2 = x+3 \quad \text{OR} \quad x-2 = -x-3$$

~~$$0 = 5$$~~

$$2x = -1$$

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

$$x \in \left\{ -\frac{1}{2} \right\}$$



(55) $|3x-1| = |3x+1|$

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

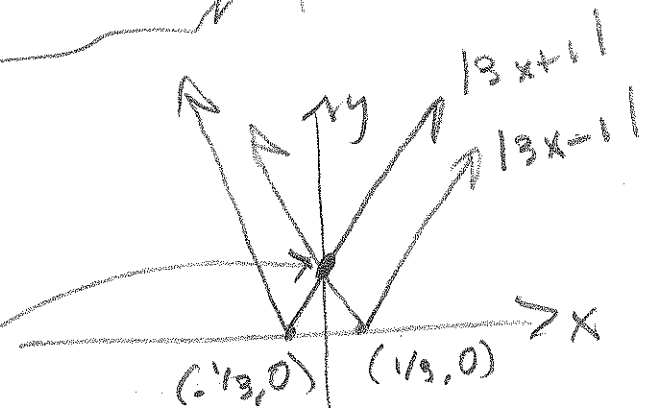
$$3x-1 = -3x-1$$

~~$$0 = 2$$~~

$$6x = 0$$

$$x = 0$$

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



Pictures just so you can 'see' the situation!

099 \$2.5 #, 57-65, 7-9

(57) $|.03 - .01x| = |.04 + .05x|$ (Times 100)

$$|3 - x| = |4 + 5x|$$

$$|-x + 3| = |5x + 4|$$

$$|x - 3| = |5x + 4|$$

FACT:

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

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

$$= |x - 3|$$

$$x - 3 = 5x + 4 \text{ OR } x - 3 = -5x - 4$$

$$-4x = 7$$

$$6x = -1$$

$$x = -\frac{7}{4} \text{ OR } x = -\frac{1}{6}$$

$$x \in \left\{ -\frac{1}{6}, -\frac{7}{4} \right\}$$

(59) $|x - 2| = |2 - x|$ Heh, same trick:

$$|2 - x| = |-x + 2|$$

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

$$= |x - 2|$$

↳ They're identical!

From: $|ab| = |a||b|$

property of absolute value.

Lets us factor a -1 out of absolute value, without changing anything!

$$\text{Solution } \subseteq \{x \mid x \text{ is real}\}$$

$$= (-\infty, \infty)$$

$$= \mathbb{R}$$

0019 § 2.3 #561-65

$$(61) \left| \frac{x}{5} - 1 \right| = \left| 1 - \frac{x}{5} \right| \text{ Duh!}$$

Same!

$$\left| \frac{x}{5} - 1 \right|$$

$$2 \cdot \frac{6}{3} \quad 2 \cdot \frac{4}{2}$$

$$\boxed{x \in \mathbb{R}}$$

$$(63) \left| \frac{2}{3}b - \frac{1}{4} \right| = \left| \frac{1}{6}b + \frac{1}{2} \right|$$

$$\text{LCD} = 12 = 2 \cdot 2 \cdot 3$$

$$\left| \frac{2b}{3} \cdot \frac{4}{4} - \frac{1}{4} \cdot \frac{3}{3} \right| = \left| \frac{b}{6} \cdot \frac{2}{2} + \frac{1}{2} \cdot \frac{6}{6} \right|$$

$$\left| \frac{8b-3}{\text{LCD}} \right| = \left| \frac{2b+6}{\text{LCD}} \right|$$

$$|8b-3| = |2b+6|$$

$$8b-3 = 2b+6 \quad \text{or} \quad 8b-3 = -2b-6$$

$$6b = 9$$

$$10b = -3$$

$$b = \frac{9}{6} = \frac{3}{2}$$

$$b = -\frac{3}{10}$$

$$\boxed{b \in \left\{ -\frac{3}{10}, \frac{3}{2} \right\}}$$

099 \$ 2.5 \neq 65, 67, \dots\$

(65) $|.12 - .04| = |.3a + .08|$ TIMES 100

$|10a - 4| = |30a - 8|$ Divide all by 2
 $|5a - 2| = |15a - 4|$ Smaller, nicer.

$5a - 2 = 15a - 4$ or $5a - 2 = -15a + 4$

$-10a = -2$

$20a = -6$

$a = \frac{-2}{-10} = \frac{1}{5}$

$a = \frac{-6}{20} = -\frac{3}{10}$

$a \in \left\{ -\frac{3}{10}, \frac{1}{5} \right\}$

(67) Block Solve...

(a) $4x - 5 = 0$

$x = \frac{5}{4}$

(b) $|4x - 5| = 0$ $\pm 0 = 0$

$x = \frac{5}{4}$

(c) $4x - 5 = 3$

$4x = 8$

$x = 2$

(d) $|4x - 5| = 3$

$4x - 5 = \pm 3$

$4x = 5 \pm 3$

$x = \frac{5 \pm 3}{4}$

$\frac{8}{4} = 2$

$\frac{2}{4} = \frac{1}{2}$

$x \in \left\{ \frac{1}{2}, 2 \right\}$