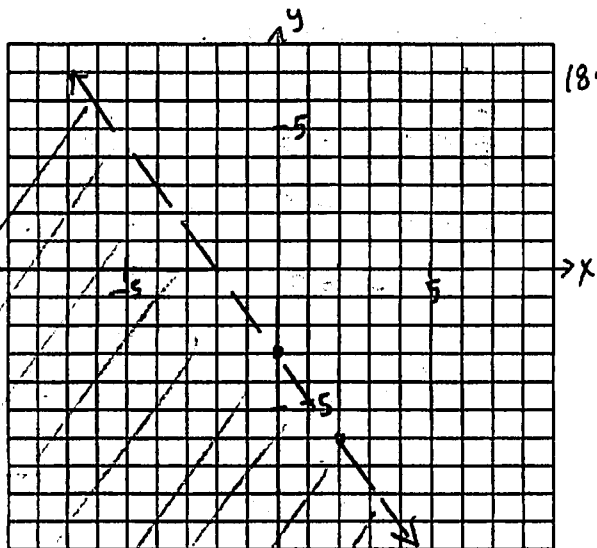Show all necessary steps Clearly, Neatly, and Systematically to receive full credit. Any incorrect statement will be penalized.

1. Graph the solution set of the inequality: $-\dfrac{x}{6}-\dfrac{y}{9}>\dfrac{1}{3}$.

$18\cdot\left(-\dfrac{x}{6}-\dfrac{y}{9}\right)>\left(\dfrac{1}{3}\right)\cdot 18$

$-3x-2y>6$

$-2y>3x+6$

$y<\dfrac{3}{-2}x+\dfrac{6}{-2}$

$y<-\dfrac{3}{2}x-3$

Test pick $(0,0)$

$-\dfrac{0}{6}-\dfrac{0}{9}>\dfrac{1}{3}$

$0>\dfrac{1}{3}$ ← false

2. Solve: $\dfrac{3}{4}(x-2)-\dfrac{1}{5}(x-8)>-\dfrac{1}{2}$. Write the solution set in <u>interval notation</u> and <u>graph.</u>

$\dfrac{3}{4}x-\dfrac{3}{2}-\dfrac{1}{5}x+\dfrac{8}{5}>-\dfrac{1}{2}$

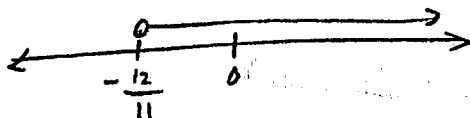$20\cdot\left(\dfrac{3}{4}x-\dfrac{3}{2}-\dfrac{1}{5}x+\dfrac{8}{5}\right)>\left(-\dfrac{1}{2}\right)\cdot 20$

$15x-30-4x+32>-10$

$11x+2>-10$

$11x>-12$

$x>-\dfrac{12}{11}$

$\left(-\dfrac{12}{11},\infty\right)$

3. **Solve by substitution method:** $\begin{cases} \dfrac{3}{2}x + y = 3 \quad \text{——} \; \varepsilon_1 \\ \dfrac{2}{3}x + \dfrac{1}{3}y = 1 \quad \text{——} \; \varepsilon_2 \end{cases}$

$\langle \varepsilon_1 \text{ and solve } y \rangle$

$\dfrac{3}{2}x + y = 3$

$\quad\quad y = -\dfrac{3}{2}x + 3$

$\langle \text{sub. } y = -\dfrac{3}{2}x + 3 \text{ into } \varepsilon_2 \rangle$

$\dfrac{2}{3}x + \dfrac{1}{3}y = 1$

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

$\dfrac{2}{3}x - \dfrac{1}{2}x + 1 = 1$

$\quad\quad \dfrac{1}{6}x + 1 = 1$

$\quad\quad\quad \dfrac{1}{6}x = 0$

$\quad\quad\quad\quad x = 0$

$\langle \text{sub } x = 0 \text{ into } \varepsilon_1 \rangle$

$\dfrac{3}{2}x + y = 3$

$\dfrac{3}{2}(0) + y = 3$

$\quad\quad\quad y = 3$

$(0, 3)$

4. **Solve:** $13|14 - 15x| - 16 > 10$. **Write the solution set in interval notation.**

$13|14 - 15x| > 26$

$|14 - 15x| > 2$

$14 - 15x > 2 \quad \underset{\text{union}}{\text{or}} \quad 14 - 15x < -2$

$\quad -15x > -12 \quad\quad\quad\quad -15x < -16$

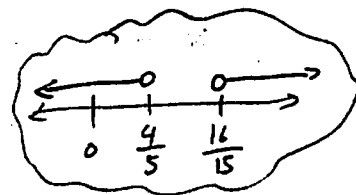$\quad\quad x < \dfrac{-12}{-15} \quad\quad\quad\quad x > \dfrac{-16}{-15}$

$\quad\quad x < \dfrac{4}{5} \quad\quad\quad\quad\quad x > \dfrac{16}{15}$

$\left(-\infty, \dfrac{4}{5}\right) \cup \left(\dfrac{16}{15}, \infty\right)$

5. How much pure dye must be added to 4 gal of a 25% dye solution to make 40% dye solution. (*make sure to show in 3-steps format*)

Pure dye   Type 1   Mix

① $\left(100\%\right)$ $\left(25\%\right)$ $=$ $\left(40\%\right)$

    x 4 $x+4$

②
$$x + 0.25(4) = 0.4(x+4)$$
$$x + 1 = 0.4x + 1.6$$
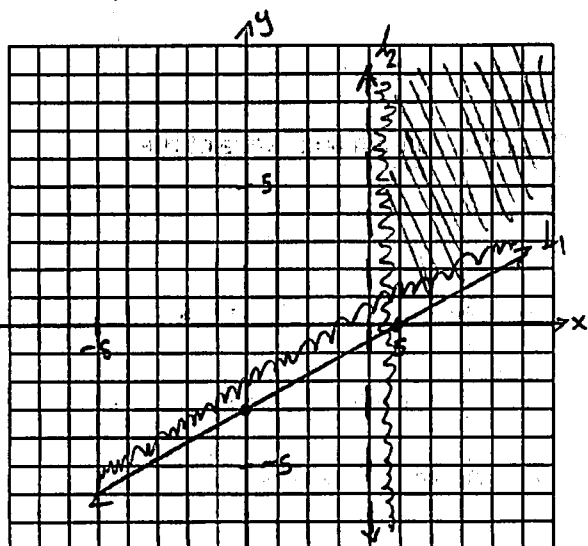$$0.6x + 1 = 1.6$$
$$0.6x = 0.6$$
$$x = 1$$

③ need 1 gal of pure dye.

6. Graph the solution set of the compounded inequality: $\underline{\underline{3x-5y\leq15}}$ and $\underline{\underline{x>4.}}$
                                               L_1 L_2

intersection.

$$3x - 5y \leq 15$$
$$-5y \leq -3x + 15$$
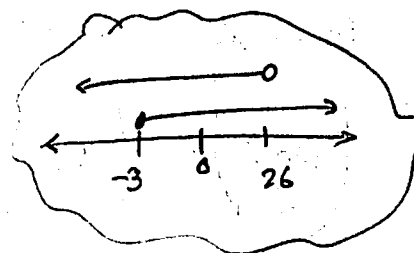$$y \geq \frac{3}{5}x - 3$$

Test pick (0,0)
$$3(0) - 5(0) \leq 15$$
$$0 \leq 15$$
↑
true

7. Solve: $-\dfrac{11}{13}x > -22$ or $3x + 2 \geq -7$. Write the solution set in interval notation and set-builder notation.

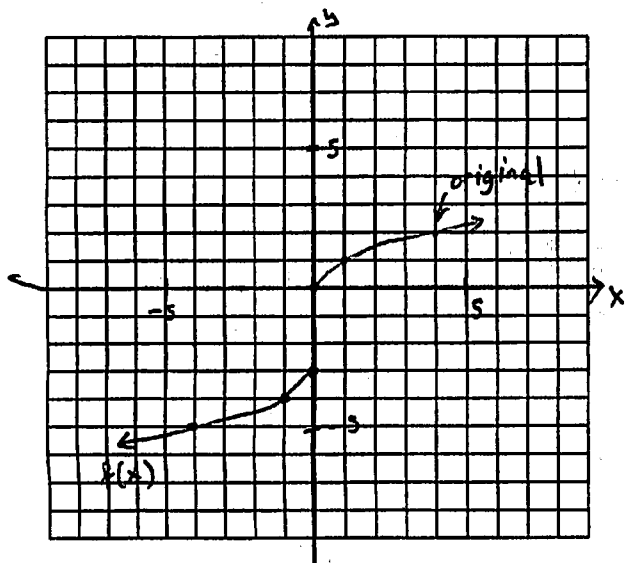$x < -22 \cdot -\dfrac{13}{11}$

$x < 26$

$3x \geq -9$

$x \geq -3$

union

$(-\infty, \infty)$

$\{x \mid x = \mathbb{R}\}$

8. Graph the given function by transformation: $f(x) = -\sqrt{-x} - 3$. State the domain and range of the function.

$y = \sqrt{x}$

$y = -\sqrt{x}$ rotate about x-axis

$y = -\sqrt{-x}$ rotate about y-axis

$y = -\sqrt{-x} - 3$ down 3 units

Domain : $(-\infty, 0]$

Range : $(-\infty, -3]$

9. Solve by elimination method: $\begin{cases} -2x+5y+z=-3 & \text{—— } \mathcal{E}_1 \\ 5x+14y-z=-11. & \text{—— } \mathcal{E}_2 \\ 7x+9y-2z=-5 & \text{—— } \mathcal{E}_3 \end{cases}$

$\langle \mathcal{E}_1 \text{ and } \mathcal{E}_2 \text{ , eliminate } z \rangle$

$$\begin{array}{r} -2x + 5y + z = -3 \\ +\quad 5x + 14y - z = -11 \\ \hline 3x + 19y \quad\quad = -14 \quad\text{—— } \mathcal{E}_4 \end{array}$$

$\langle \mathcal{E}_1 \text{ and } \mathcal{E}_3 \text{ , eliminate } z \rangle$

$2 \cdot \begin{cases} -2x + 5y + z = -3 \\ 7x + 9y - 2z = -5 \end{cases}$

$$\begin{array}{r} -4x + 10y + 2z = -6 \\ +\quad 7x + 9y - 2z = -5 \\ \hline 3x + 19y \quad\quad = -11 \quad\text{—— } \mathcal{E}_5 \end{array}$$

$\langle \mathcal{E}_4 \text{ and } \mathcal{E}_5 \text{ , eliminate } x \rangle$

$-1 \cdot \begin{cases} 3x + 19y = -14 \\ 3x + 19y = -11 \end{cases}$

$$\begin{array}{r} -3x - 19y = 14 \\ +\quad 3x + 19y = -11 \\ \hline 0 = 3 \quad\leftarrow \text{false} \end{array}$$

$$\phi$$

10. Solve: $\dfrac{1}{5}\left|\dfrac{2}{3}x+\dfrac{1}{6}\right|+\dfrac{5}{2}<\dfrac{1}{2}.$

$$\frac{1}{5}\left|\frac{2}{3}x + \frac{1}{6}\right| < -\frac{4}{2}$$

$$\frac{1}{5}\left|\frac{2}{3}x + \frac{1}{6}\right| < -2$$

$$\left|\frac{2}{3}x + \frac{1}{6}\right| < -10$$

$$\phi$$

11. Solve: $\left|\dfrac{2}{3}x-2\right|=\left|\dfrac{1}{3}x+3\right|$.

$$\dfrac{2}{3}x-2=\dfrac{1}{3}x+3 \qquad or \qquad \dfrac{2}{3}x-2=-\left(\dfrac{1}{3}x+3\right)$$

$$\dfrac{1}{3}x-2=3 \qquad\qquad \dfrac{2}{3}x-2=-\dfrac{1}{3}x-3$$

$$\dfrac{1}{3}x=5 \qquad\qquad 2x-6=-x-9$$

$$x=15 \qquad\qquad 3x-6=-9$$

$$3x=-3$$

$$x=-1$$

$$\{-1, 15\}$$

12. Dan has invested $12,000 in bonds paying 6%. How much additional money should he invest in a certificate of deposit paying 3% simple interest so that the total interest earn will be 4% of the total investment? (*Make sure to* <u>*show in 3-steps format*</u>)

①

	P	r	t	I
B	12000	0.06	1	0.06(12000)
CD	x	0.03	1	0.03 x

②

$$0.06(12000)+0.03(x)=0.04(12000+x)$$
$$720+0.03x=480+0.04x$$
$$720=480+0.01x$$
$$240=0.01x$$
$$\dfrac{240}{0.01}=x$$
$$24000=x$$

③ $24000 invested in CD.