1. $\frac{2x^2-x-10}{2x^2+3x-20} \cdot \frac{6x^2-24}{3x^2+12x+12}$

$\frac{2x^2-5x+4x-10}{2x^2+8x-5x-20} \cdot \frac{6(x^2-4)}{3(x^2+4x+4)}$

$\frac{x(2x-5)+2(2x-5)}{2x(x+4)-5(x+4)} \cdot \frac{6(x-2)(x+2)}{3(x+2)(x+2)}$

$\frac{(2x-5)(x+2)}{(x+4)(2x-5)} \cdot \frac{6(x-2)(x+2)}{3(x+2)(x+2)} = \frac{2(x-2)}{x+4}, \; x \neq -4, -2, \frac{5}{2}$

2. $\frac{x^2-2x-8}{x^2-9} \div \frac{x^2+5x+6}{x^2+6x+9}$

$\frac{(x-4)(x+2)}{(x-3)(x+3)} \cdot \frac{(x+3)(x+3)}{(x+2)(x+3)}$

$= \frac{x-4}{x-3}, \; x \neq -3, -2, 3$

3. $\frac{x-2}{x-3} - \frac{x^2-2}{x^2+x-12}$

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

$\frac{x^2-2x+4x-8}{(x+4)(x-3)} - \frac{(x^2-2)}{(x+4)(x-3)}$

$\frac{2x-6}{(x+4)(x-3)} = \frac{2(x-3)}{(x+4)(x-3)} = \frac{2}{x+4}, x \neq -4, 3$

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

$= \frac{\frac{3(x+1)}{x(x+1)} + \frac{4x}{x(x+1)}}{\frac{5(x+1)}{x(x+1)} - \frac{3x}{x(x+1)}}$

$= \frac{\frac{3x+3+4x}{x(x+1)}}{\frac{5x+5-3x}{x(x+1)}} = \frac{\frac{7x+3}{x(x+1)}}{\frac{2x+5}{x(x+1)}} = \frac{7x+3}{x(x+1)} \cdot \frac{x(x+1)}{2x+5}$

$= \frac{7x+3}{2x+5}, x \neq 0, -1, -5/2$

5. $\sqrt{48x^5y^2}$

$= \sqrt{16 \cdot 3 \cdot x^4 \cdot x \cdot y^2}$

$= \sqrt{4^2 \cdot 3 \cdot (x^2)^2 \cdot x \cdot y^2}$

$= 4x^2 y\sqrt{3x}$

$= |4x^2 y|\sqrt{3x}$

$= 4x^2|y|\sqrt{3x}$

6. $\sqrt[3]{64x^5y^6}$

$= \sqrt[3]{4^3 \cdot x^3 \cdot x^2 (y^2)^3}$

$= 4xy^2\sqrt[3]{x^2}$

$= |\cancel{\ }|\sqrt[3]{x^2}$

7. $\sqrt[5]{32x^{15}y^{-10}z^{-20}}$

$32^{1/5} = \sqrt[5]{32} = \sqrt[5]{2^5} = 2$

$(32x^{15}y^{-10}z^{-20})^{1/5}$

$32^{1/5}x^{3}y^{-2}z^{-4}$

$= \dfrac{2x^3}{y^2z^4}$

8. $\dfrac{2x}{x-1} = \dfrac{-3}{x-2}$

$x = 3/2, -1$

$2x(x-2) = -3(x-1)$

$2x^2 - 4x = -3x + 3$

$2x^2 - x - 3 = 0$

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

$x = \dfrac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-3)}}{2(2)}$

...

9. $\frac{3}{x+4} = \frac{2}{x+1} - \frac{9}{x^2+5x+4}$ $\cdot \frac{(x+4)(x+1)}{1}$

$3(x+1) = 2(x+4) - 9$

$3x+3 = 2x+8-9$

$3x-2x = -1-3$

$x = -4$

NO solution

10. $xyz = 2(y-x)$

$xyz = 2y - 2x$

$xyz + 2x = 2y$

$x(yz+2) = 2y$

$x = \frac{2y}{yz+2}$

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

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

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

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

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

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

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

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

$$=\frac{x+3}{3x+1},\ x\neq -\tfrac{1}{3},1,-1$$

9. Simplify.

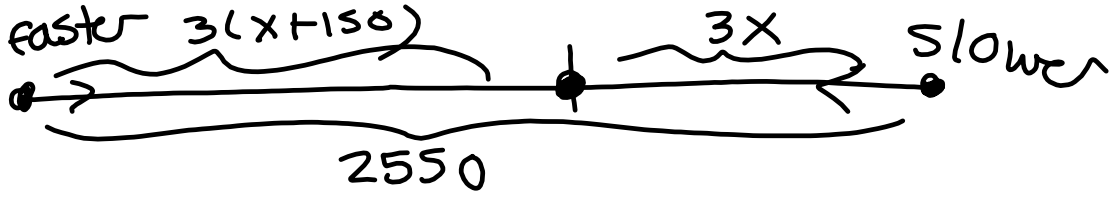
$$\sqrt{24x^3y^2}$$

24. How much water must be evaporated from 40 gallons of 12% fruit juice in order to obtain 15% fruit juice?

drink	volume of drink	% concentration	amt of substance
12%	40	.12	40(.12)
water	x	0	0
15%	40-x	.15	(40-x).15

$$40(.12) = (40-x)(.15)$$

23. Two airplanes are 2550 miles apart and traveling toward each other. One plane is traveling 150 miles per hour faster than the other plane. The planes meet in 3 hours. Find the speed of each plane.



plane	rate	×	time	=	distance
fast	x+150		3		3(x+150)
slow	x		3		3x

$$3(x+150)+3x=2550$$

II. Translate the verbal expression into a variable expression in terms of a single variable. Do not simplify.

21. The total of twelve times a number and three less than the number.

22. Twice the difference between four more than twice a number and one more than the number.

16. Subtract. Write your answer as a single, simplified fraction, and state the values of the variable for which the expression is undefined.

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

22. Rewrite as a radical expression. Do not simplify the radical.
$(32xy^2)^{3/5}$

23. Rewrite as an exponential expression. Simplify the expression.
$\sqrt[3]{9^{3/2}x^{-6}y^{-9}z^{15}}$

Write a linear (single variable) equation to describe the word problem. Do not solve.

23. Find three consecutive odd integers such that twice the difference between the first and third is 19 less than the second.

$2(\quad) = -19$

$x, x+2, x+4$

$2(x - (x+4)) = x+2 - 19$

24. 50 pounds of delicious Jamaican Blue Mountain coffee that costs $28 per pound are mixed with Fakin' Blue Discount Coffee that costs $4 per pound. How much Fakin' Blue is needed to make a coffee blend that costs $15 per pound?

VI. Given the sets A, B, and C (and all the usual sets listed on the first page), determine the following unions, intersections, and relative complements. Give the answer in the simplest form possible.

$$A = \{1, 2, 3, 4, 5\}, B = \left\{-2, -1, \frac{1}{2}, \frac{5}{6}, 3, 5, 6\right\}, C = \{-\sqrt{5}, \pi\}$$

29. $A \cup \mathbb{N}$ = $\mathbb{N}$

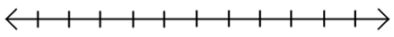
30. $C \cap \mathbb{Q}$ = $\emptyset$

31. $A - B$ = $\{1, 2, 4\}$

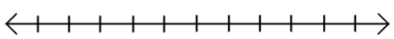
32. $B \cup \mathbb{R}$ = $\mathbb{R}$

VIII. Graph the compound inequality on the number line, and give the solution in your choice of notation.

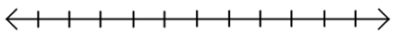
35. $x < 3$ *or* $x \geq -5$



36. $x > 4$ *or* $x \leq -2$



37. $x < 2$ *and* $x \geq -3$



38. $x > 1$ *and* $x \leq -4$