Name: ____ Date: __________

PC: Geometric approach to Absolute Value Eqs and Ineqs Ms. Loughran

Do Now:

1. Simplify: $\frac{1+c^{-1}-20c^{-2}}{1-5c^{-2}+4c^{-1}} = \frac{c^2\left(1+\frac{1}{c}-\frac{20}{c^2}\right)}{c^2\left(1-\frac{5}{c^2}+\frac{4}{c}\right)} = \frac{c^2+c-20}{c^2-5+4c} = \frac{c^2+c-20}{c^2+4c-5} = \frac{\cancel{(c+5)}(c-4)}{\cancel{(c+5)}(c-1)}$

$\frac{c-4}{c-1}$ $c \neq 0, -5, 1$

Geometric Definition of Absolute Value:

$|x| = |x-0|$ x's distance from 0 on the number line

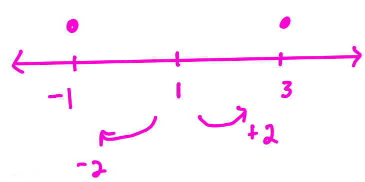
$|x-a|$ x's distance from a on the # line

$|x+a| = |x-(-a)|$ x's distance from $-a$ on the # line

Examples: Solve each of the following using the geometric definition of absolute value.

1. $|x-1|=2$

x's distance from 1 equals 2

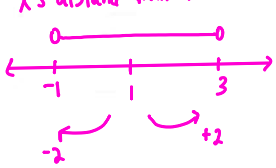


$\{-1, 3\}$

When it says using the geometric definition, you need:
① the sentence
② the graph on the # line
③ solution

2. $|x-1|<2$

x's distance from 1 < 2



SB: $\{x \mid -1 < x < 3\}$ set builder

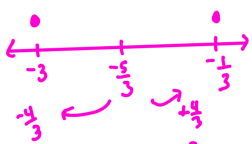
IN: $(-1, 3)$ interval notation

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

$\dfrac{3\left|x+\frac{5}{3}\right|}{3}=\dfrac{4}{3}$

$\left|x+\frac{5}{3}\right|=\frac{4}{3}$

x's distance from $-\frac{5}{3}$ $=\frac{4}{3}$



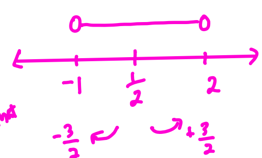
$\left\{-3, -\frac{1}{3}\right\}$

4. $|2x-1|<3$

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

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

x's distance from $\frac{1}{2}<\frac{3}{2}$



the set of all x's such that

SB: $\{x \mid -1<x<2\}$

IN: $(-1, 2)$

5. $|7-3x|\le 2$

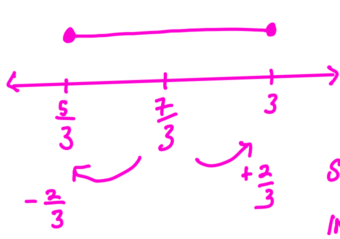
$|a-b|=|b-a|$

$|3x-7|\le 2$

$3\left|x-\frac{7}{3}\right|\le 2$

$\left|x-\frac{7}{3}\right|\le\frac{2}{3}$

x's distance from $\frac{7}{3}\le\frac{2}{3}$



SB: $\left\{x \mid \frac{5}{3}\le x\le 3\right\}$

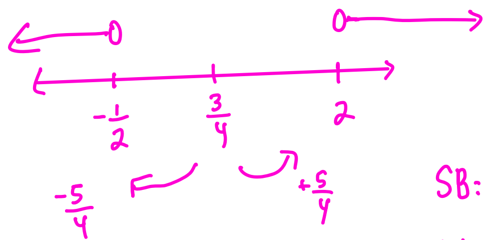
IN: $\left[\frac{5}{3}, 3\right]$

6. $|4x-3|>5$

$$4\left|x-\frac{3}{4}\right|>5$$

$$\left|x-\frac{3}{4}\right|>\frac{5}{4}$$

x's distance from $\frac{3}{4}$ > $\frac{5}{4}$



SB: $\{x \mid x<-\frac{1}{2} \overset{\vee}{\text{OR}} x>2\}$

IN: $(-\infty, -\frac{1}{2}) \overset{\cup}{\text{or}} (2, \infty)$

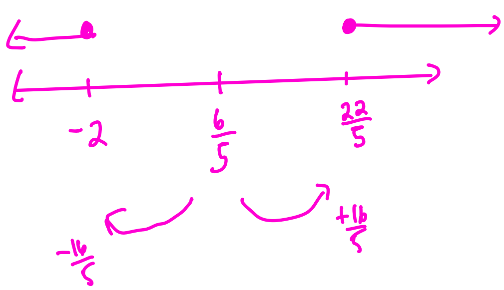
7. $|6-5x|\geq 16$

$$|5x-6|\geq 16$$

$$5\left|x-\frac{6}{5}\right|\geq 16$$

$$\left|x-\frac{6}{5}\right|\geq \frac{16}{5}$$

x's distance from $\frac{6}{5}$ ≥ $\frac{16}{5}$



SB: $\{x \mid x\leq -2 \text{ or } x\geq \frac{22}{5}\}$

IN: $(-\infty, -2]$ or $[\frac{22}{5}, \infty)$

Simplify each of the following.

Homework 10-02

2. $\dfrac{\frac{1}{a}+\frac{3}{b}}{\frac{1}{b}-\frac{3}{a}}$

3. $\dfrac{5-\frac{3}{a}}{3+\frac{1}{a}}$

4. $\dfrac{\frac{1}{2}-\frac{2}{x}}{\frac{3}{x}-\frac{1}{x^2}}$

5. $\dfrac{\frac{1}{x}+\frac{1}{y}}{\frac{1}{x}-\frac{1}{y}}$

6. $\dfrac{1-\frac{2}{n}}{\frac{4-n^2}{n}} = \dfrac{-1}{2+n}$ $\quad n \neq 0, \pm 2$

7. $\dfrac{1+\frac{1}{x}}{1-\frac{1}{x^2}}$

8. $\dfrac{\frac{a}{a+b}}{1-\frac{b}{a+b}} = 1$ $\quad a \neq 0, -b$

9. $\dfrac{x^{-1}}{x^{-1}-y^{-1}}$

10. $\dfrac{x^{-1}+y^{-1}}{x^{-1}-y^{-1}} = \dfrac{y+x}{y-x}$ $\quad x, y \neq 0$ $\quad x \neq y$

11. $\dfrac{a^{-2}-1}{1+a^{-1}}$

12. $\dfrac{\frac{1}{n}-\frac{1}{3n^2}}{1-\frac{1}{9n^2}} = \dfrac{3}{3n+1}$ $\quad n \neq 0, \pm\frac{1}{3}$

13. $\dfrac{1+a^{-1}}{a-a^{-1}} = \dfrac{1}{a-1}$ $\quad a \neq 0, \pm 1$

$\dfrac{1+\frac{1}{a}}{a-\frac{1}{\cancel{a}}} = \dfrac{a+1}{a^2-1} = \dfrac{\cancel{a+1}}{(\cancel{a+1})(a-1)} = \dfrac{1}{a-1}$

14. $\dfrac{x+2x^{-1}-3}{x-1-2x^{-1}} = \dfrac{x-1}{x+1}$ $\quad x \neq 0, 2, -1$

$\dfrac{x}{1} \cdot \dfrac{\frac{x}{1}+\frac{2}{\cancel{x}}-3}{x-1-\frac{2}{\cancel{x}}}$ $\quad \dfrac{x^2+2-3x}{x^2-x-2} = \dfrac{x^2-3x+2}{x^2-x-2} = \dfrac{\cancel{(x-2)}(x-1)}{\cancel{(x-2)}(x+1)}$

15. $\dfrac{2x^{-1}-2}{\frac{1-x}{x}}$

20. $$\frac{\dfrac{x}{x+1}}{\dfrac{1}{x^2-1}+\dfrac{-1}{x-1}} = -(x-1) \quad x \neq 0, \pm 1$$

$$\frac{x(x-1)}{1-x-1} = \frac{\cancel{x}(x-1)}{-\cancel{x}} = -(x-1)$$

18. $$\frac{\dfrac{a}{a^2-b^2}}{\dfrac{1}{a+b}+\dfrac{1}{a-b}} = \frac{1}{2} \quad a \neq 0, \pm b$$