

## Announcements 1/21:

- Quiz Monday on Gradescope
  - open all day
  - 15 min to take
  - DSP extensions have been added

OH Mon 1/24 will be 4-5pm.

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## Addition of fractions. "common denominator"

ex.  $\frac{4}{6} + \frac{1}{6} = \frac{4+1}{6} = \frac{5}{6}$

same denominator

ex.  $\frac{4}{6} + \frac{1}{2} \times \frac{3}{3} = \frac{4}{6} + \frac{3}{6} = \frac{7}{6}$

$$\frac{a}{b} + \frac{c}{d} = \frac{ad+cb}{bd}$$

$$\left( \frac{a}{b} + \frac{c}{b} = \frac{a+c}{b} \right)$$

ex.  $\frac{1}{3} + \frac{4}{5} = \frac{1(5)+4(3)}{3(5)} = \frac{17}{15}$

ex.  $\frac{2}{5} + \frac{7}{8} = \frac{2(8)+7(5)}{5(8)} = \frac{16+35}{40} = \frac{51}{40}$

$$\underline{\text{ex.}} \quad \frac{2}{5} - \frac{7}{8} = \frac{2}{5} + \frac{(-7)}{8} = \frac{2(8) + (-7)(5)}{5(8)} = \frac{-19}{40}$$

$$\underline{\text{ex.}} \quad \frac{5}{x+1} + \frac{10}{x+1} = \frac{15}{x+1}$$

$$\underline{\text{ex.}} \quad \frac{x}{x+1} - \frac{3}{x+2} = \frac{x}{x+1} + \frac{(-3)}{x+2}$$

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

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

$$\frac{(x+1)}{(x+1)(x+2)}$$

Dividing by a fraction.  $\frac{a}{\frac{b}{c}} = a \cdot \frac{c}{b}$

$$\underline{\text{EX.}} \quad \frac{5}{\frac{1}{3}} = 5 \cdot \frac{3}{1} = 15$$

$$\underline{\text{Ex.}} \quad \text{Simplify } \frac{\frac{x+1}{2}}{\frac{3x}{x-1}} = \frac{x+1}{2} \left( \frac{x-1}{3x} \right) = \frac{(x+1)(x-1)}{6x} \checkmark$$

$$= \frac{x^2 - 1}{6x} \checkmark$$

### 0.3 Absolute Value.

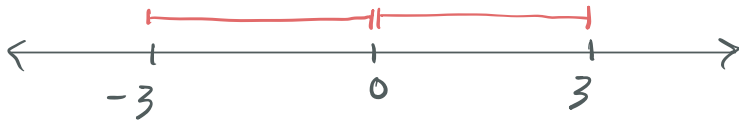
"the absolute value of  $x$ "

Absolute value,  $|x|$

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

distance from that number to 0.

$$|3| = 3, \quad |10| = 10, \quad \left|\frac{1}{2}\right| = \frac{1}{2}, \quad |\pi| = \pi, \quad |0| = 0$$
$$|-3| = 3, \quad |-10| = 10, \quad \left|-\frac{1}{2}\right| = \frac{1}{2}, \dots$$



Absolute value is ALWAYS non-neg!

Ex. Simplify  $2 \cdot |4 - 8| = 2 \cdot |-4|$   
 $= 2 \cdot (4) = 8$

Ex. Simplify  $-3|2(6-2)| = -3|2(4)|$   
 $= -3|8| = -3(8) = -24$

Ex. Find all  $x$  s.t.  $|x-4|=6$  such that

Remember that  $|-b|=b$  and  $|b|=b$ .

①  $x-4=6$   $\leftarrow (x-4) > 0$

$x=10$

②  $x-4=-6$   $\leftarrow (x-4) < 0$

$x=-2$

$|10-4|=|6|=6 \checkmark$

$|-2-4|=|-6|=6 \checkmark$

Ex.  $2|3x-1|=20$  divide both sides by two  
 $|3x-1|=10$

$3x-1=10$

$3x=11$

$x=\frac{11}{3}$

$3x-1=-10$

$3x=-9$

$x=-3$

Exercise.  $|2x+1|-3=10$   
 $+3 \quad +3$

$|2x+1|=13$

$2x+1=13$

$2x=12$

$2x+1=-13$

$2x=-14$

$x=6, -7$

Ex.  $|3x| = -9$  (NO SOLUTIONS)

$$x = 3, -3$$

(\*) Graphing functions

Ex.  $|x-1| = 3x$

$$x-1 = 3x$$

$$-1 = 2x$$

~~$x = \frac{-1}{2}$~~  NOT A SOL

$$x-1 = -3x$$

$$-1 = -4x$$

$x = \frac{1}{4}$  ✓

$$|\frac{1}{4}-1| = |-\frac{3}{4}|$$

$$= \frac{3}{4} \quad \checkmark$$

$$3(\frac{1}{4}) = \frac{3}{4}$$

$$|-\frac{1}{2}-1| = |-\frac{3}{2}| = \frac{3}{2}$$

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

Exercise  $|x| + |x+1| = 2$

$$x < 0 \Rightarrow |x| = -x$$

$$x+x+1 = 2 \quad (x > 0)$$

$$2x+1 = 2$$

$$x = \frac{1}{2} \quad (\text{check, its good})$$

$$-x-(x+1) = 2 \quad (x < -1)$$

$$-2x-1 = 2$$

$$x = -\frac{3}{2} \quad (\text{check, its good})$$