

1. Warm Up: Simplify the following rational expressions by adding/subtracting.

a. $\frac{1}{7} + \frac{3}{7} = \boxed{\frac{4}{7}}$

b. $\frac{2}{5} + \frac{3}{10}$

$$\frac{2 \cdot 2}{5 \cdot 2} + \frac{3}{10}$$

$$\frac{4}{10} + \frac{3}{10} = \boxed{\frac{7}{10}}$$

Same denominators ①

c. $\frac{1}{x+2} + \frac{2}{x+2}$

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

d. $\frac{2}{x+2} + \frac{2}{x^2-4}$

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

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

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

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

$$\text{Same denominators} \rightarrow \frac{2x-4}{(x+2)(x-2)} + \frac{2}{(x+2)(x-2)}$$

2. Why do fractions have to have common denominators to add/subtract together?

 They are the units of these problems. Can only add if they have same unit.

 ex: 1 apple + 3 apples = 4 apples, 1 inch + 3 inches = 4 inches,

 1 seventh + 3 sevenths = 4 sevenths ($\frac{1}{7} + \frac{3}{7} = \frac{4}{7}$)

 3. Simplify then state the asymptote(s) $\frac{2}{x+3} - \frac{5}{x^2+7x+12}$

① Factor: $x^2+7x+12 = (x+3)(x+4)$

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

② Multiply to get same denominators

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

③ Combine + Simplify

$$\frac{2x+8-5}{(x+3)(x+4)}$$

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

④ Asymptotes

$$x+3=0 \quad \boxed{x=-3}$$

$$x+4=0 \quad \boxed{x=-4}$$

You Try: Simplify by adding/subtracting, then state the asymptotes of the result.

4. $\frac{4x}{x+5} - \frac{x-3}{2x-7}$

$$\frac{7x^2 - 30x + 15}{(x+5)(2x-7)}$$

Asymptotes
 $x = -5, x = \frac{7}{2}$

5. $\frac{3x^2}{x^2-3} - \frac{5}{2x^2+1}$

$$\frac{3x^2(2x^2+1)}{(x^2-3)(2x^2+1)} - \frac{5(x^2-3)}{(2x^2+1)(x^2-3)}$$

$$\frac{6x^4 - 2x^2 + 15}{(x^2-3)(2x^2+1)}$$

$$\frac{6x^4 + 3x^2 - (5x^2 - 15)}{(x^2-3)(2x^2+1)}$$

Asymptotes

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

$$x^2 - 3 = 0$$

$$2x^2 + 1 = 0$$

$$x^2 = 3$$

$$2x^2 = -1$$

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

$$x = \sqrt{3}$$

$$x = -\sqrt{3}$$

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

$$x = i\sqrt{\frac{1}{2}}, x = -i\sqrt{\frac{1}{2}}$$

$$\frac{6x^4 + 3x^2 - 5x^2 + 15}{(x^2-3)(2x^2+1)}$$

6. $\frac{x^2-2x+3}{x^2+7x+12} - \frac{x^2-4x-5}{x^2+7x+12}$

$$\frac{2x+8}{(x+4)(x+3)} \text{ (or)}$$

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

Asymptotes

$$x = -3$$