

CP Pre-Calculus

Simplify the following expressions fully. State the restricted values for #1 and #2 only.

1)  $\frac{x^2+4x}{x+3} \cdot \frac{x^2-9}{x^2+x-12}$

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

$= x$

Restricted values:  $x \neq 3, -4, -3$

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

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

$= \frac{6x^2+6x+3x+6}{den}$

$= \frac{6x^2+9x+6}{den} = \frac{3(2x^2+3x+2)}{(2x-3)(2x+2)}$

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

Restricted values:  $x \neq 3/2, -1$

3)  $\frac{x+3}{x^2-6x+9} - \frac{5}{3-x}$

$-1(x-3)$

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

$= \frac{6x-12}{(x-3)(x-3)}$

5)  $\frac{4x^2-10x-24}{7x^2-63x+140} \cdot \frac{12x^2+30x+18}{3x^2+18x+15}$

$\frac{2(2x+3)(x-4)}{(2x+3)(x+1)}$  } num.

$\frac{7(x^2-9x+20)}{3(x^2+6x+5)}$

$\frac{7(x-4)(x-5)}{3(x+5)(x+1)}$  } den

so  $\frac{2(x-4)}{(x+1)} \cdot \frac{3(x+5)(x+1)}{7(x+1)(x-5)}$   
 $= \frac{6(x+5)}{7(x-5)}$

4)  $\frac{(x^3+125)}{10} \cdot \frac{10}{x^2-5}$

$= \frac{(x+5)(x^2-5x+25)}{10}$

$= \frac{x^2-25}{20}$

$= \frac{(x+5)(x^2-5x+25)}{20} = \frac{20}{(x+5)(x-5)}$

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

$= \frac{2(x^2-5x+25)}{x-5}$

#6 - at end.

Solve the following rational equations. Be sure to check your answers.

$$\frac{(x+4)}{(x+4)} \cdot \frac{2x+1}{x-4} = \frac{16}{x^2-16} + 3 \left( \frac{x^2-16}{x^2-16} \right)$$

$x \neq 4$  or  $-4$

$$2x^2 + 9x + 4 = 16 + 3x^2 - 48$$

$$0 = x^2 - 9x + 36$$

$$0 = (x-12)(x+3)$$

$$x = 12 \quad x = -3$$

$$\frac{(x+1)}{(x+1)} \cdot \frac{2x+3}{x-1} = \frac{10}{x^2-1} + \frac{2x-3}{x+1} \left( \frac{x-1}{x-1} \right)$$

$$2x^2 + 5x + 3 = 10 + 2x^2 - 5x + 3$$

$$10x = 10$$

$$x = 1$$

but  $x \neq 1$

so

no soln.

$$\frac{4(x+3)}{4(x+3)} \cdot \frac{1}{x} + \frac{1 \cdot x}{x+3} = \frac{1}{4} \left( \frac{x+3}{x+3} \right) \frac{x}{x}$$

$$4x + 12 + 4x = x^2 + 3x$$

$$8x + 12 = x^2 + 3x$$

$$0 = x^2 - 5x - 12$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

use QF.  $x = \frac{5 \pm \sqrt{25 + 48}}{2}$

$$x \neq 0, -3$$

$$x = \frac{5 \pm \sqrt{73}}{2}$$

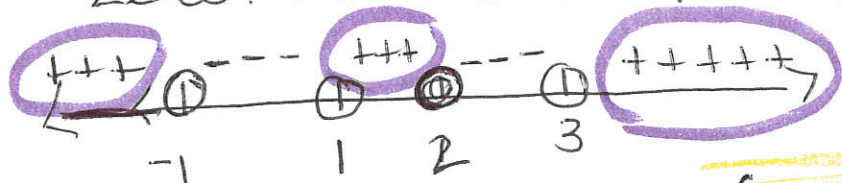
Solve each inequality below.

$$10) \frac{x^2 - x - 2}{x^2 - 4x + 3} > 0$$

$$\frac{(x-2)(x+1)}{(x-3)(x-1)} > 0$$

den  $\neq 0 \rightarrow$  open  $x \neq 3$   
 $x \neq 1$

Zeros: num = 0  $x = 2, -1$  (open)



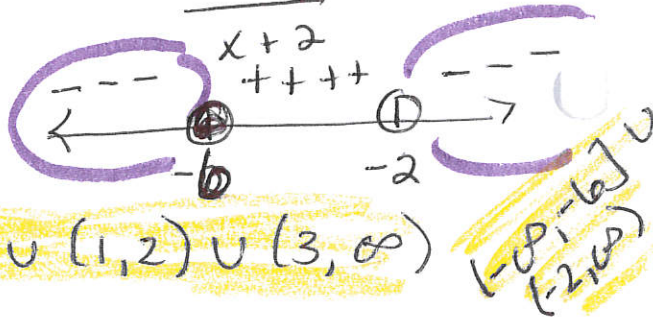
want  $> 0 \rightarrow$  pos.  $(-\infty, -1) \cup (1, 2) \cup (3, \infty)$

$$11) \frac{x-2}{x+2} \leq 2$$

$$\frac{x-2}{x+2} - \frac{2(x+2)}{x+2} \leq 0$$

$$\frac{x-2-2x-4}{x+2} \leq 0$$

$$\frac{-x-6}{x+2} \leq 0$$



$[-\infty, -6] \cup (-2, \infty)$

# Solution to #6

$$6. \quad \frac{4(x+2) + 2(x-5)}{(x-5)(x+2)} = \frac{2x+3(x+2)}{(x-5)(x+2)}$$

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

$$= \frac{6x-2}{1} \cdot \frac{1}{5x+6}$$

$$= \frac{6x-2}{5x+6}$$

