

Part 1. Multiple Choice.

1. What are the non-permissible values for the rational expression? $\frac{x-2}{x^2+10x-24}$

- A) $x \neq \{-2, 12\}$ B) $x \neq -12$ C) $x \neq 2$ **D) $x \neq \{2, -12\}$**

2. Simplify: $\frac{x^2-5x+6}{2x^2-2} \div \frac{x-2}{2x-2}$

- A) $\frac{x-6}{x-2}$ B) -3 **C) $\frac{x-3}{x+1}$** D) $x-3$

3. Simplify: $\frac{3x^2-6x}{2-x}$

- A) $3x$ **B) $-3x$** C) 3 D) -3

4. Simplify: $\frac{3m^2-6m}{m+2} - \frac{24}{m+2}$

- A) $\frac{3(m^2-2m-8)}{m+2}$ B) $\frac{3m^2-6m-24}{m+2}$ **C) $3(m-4)$** D) $m-4$

5. Simplify: $3 - \frac{9}{\frac{n}{9-n}}$

- A) $\frac{3}{n}$ B) $n+3$ **C) $\frac{3}{n+3}$** D) $\frac{3}{n-3}$

Part 2 – Answer all questions in the space provided. Show all steps! (20)

6. Simplify: $\frac{\frac{x}{x+2}-1}{1-\frac{x}{x-2}}$

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

7. Simplify each of the following and state the non-permissible values of x.

a) $x^2 - 9x + 20 \div x^2 - 7x + 12$

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

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

$$\frac{x^2 - 3x - 2x + 6 - [x^2 - 5x - 6x + 30]}{(x-4)(x-5)(x-3)}$$

$$\frac{-6x - 24}{(x-4)(x-5)(x-3)} \Rightarrow \frac{-6(x+4)}{(x-4)(x-5)(x-3)}$$

b) $\frac{x^2 - 9}{4x^2 - x} \div \frac{x^2 + 3x}{7x + 12} \cdot \frac{x + 3x}{3x - 10x - 8}$

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

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

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

8. Solve, remember to check for extraneous roots:

$$(x+2) \left[\frac{(x+6)}{x+2(x-2)} \right] = (x+2) \left[\frac{2}{x-2} \right] + (x+2)(x-2) \left[\frac{5}{x+2} \right]$$

$$x+6 = 2(x+2) + x(x-2)$$

$$x+6 = 2x+4 + x^2 - 2x$$

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

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

$$\left. \begin{array}{l} x-2=0 \\ x+1=0 \end{array} \right\} \begin{array}{l} x=2 \\ x=-1 \end{array}$$

$x+6 \quad 2 \quad x$
 $x^2 - 4 \quad x^2 + x + 2$
 LCD: $(x-2)(x+2)$
 Since $x=2$ is an Extraneous root, $x=-1$ is the only solution.

9. A ship travels at a constant speed between ports that are 700km apart. If the ship were to travel at a speed that was 10km/h faster it would reach its destination 8 hours earlier. Create and solve a rational equation to determine the speed at which the ship normally travels.

$$\frac{700}{x} - \frac{700}{x+10} = 8 \quad \text{LCD: } (x)(x+10)$$

	Distance	Speed	Time
Regular trip	700		$\frac{700}{x}$
Faster trip	700		$\frac{700}{x+10}$

$$(x)(x+10) \left[\frac{700}{x} \right] - (x)(x+10) \left[\frac{700}{x+10} \right] = (x)(x+10)(8)$$

$$700x + 7000 - 700x = 8x^2 + 80x$$

$$8x^2 + 80x - 7000 = 0$$

$$8(x^2 + 10x - 875) = 0$$

$$x = \frac{-10 \pm \sqrt{100 - (4)(1)(-875)}}{2} = \frac{-10 \pm \sqrt{3600}}{2} = \frac{-10 \pm 60}{2}$$

$$x_1 = \frac{-10+60}{2} = \frac{50}{2} = 25, \quad x_2 = \frac{-10-60}{2} = \frac{-70}{2} = -35$$

$x = 25 \text{ km/h}$
 $x+10 \Rightarrow 25+10 = 35 \text{ km/h}$