

Unit 6 Test – Rational Expressions and Equations

Sample

Name: Key
 _____ /25 = _____ %

Part A: Multiple Choice Place the letter that corresponds with the best answer in the space provided to the right. (8 marks)

1. What are the non-permissible values for $\frac{x}{2(x+3)} + \frac{3x}{(x+3)(x+1)}$? 1. B

- A) $x \neq 0, -3$
 B) $x \neq -3, -1$ *$x \neq -3, x \neq -1$*
 C) $x \neq 0, -3, -1$
 D) $x \neq 0, -1$

2. Factor the following expression: $2x^2 - 7x + 3$ 2. D

- A) $(x - 6)(x - 1)$
 B) $(2x + 1)(x - 3)$
 C) $(2x - 3)(x - 1)$
 D) $(2x - 1)(x - 3)$ *$\begin{matrix} P6 \\ S-7 \\ 2x^2 - 7x + 3 \\ 2x^2 - 6x - x + 3 \\ 2x(x-3) - 1(x-3) \\ (2x-1)(x-3) \end{matrix}$*

3. Simplify the following: $\frac{x^2+3x-4}{2x^2+12x+16}$ 3. A

- A) $\frac{(x-1)}{2(x+2)}$
 B) $\frac{2(x-1)}{(x+2)}$
 C) $\frac{(x-1)}{(x+2)}$
 D) $\frac{(x+1)}{2(x-2)}$ *$\begin{matrix} (x+4)(x-1) \\ 2(x^2+6x+8) \\ = \frac{(x+4)(x-1)}{2(x+4)(x+2)} \\ = \frac{x-1}{2(x+2)} \end{matrix}$*

4. Simplify the following: $\frac{x^2}{6} \div \frac{3x}{2y}$ 4. A

- A) $\frac{xy}{9}$
 B) $\frac{x^3}{4y}$
 C) $\frac{x^3}{2y}$
 D) $\frac{9}{xy}$

5. Simplify: $\frac{4-2x}{x-2}$ 5. C

- A) $x - 2$
 B) 2
 C) -2
 D) 2x

6. Simplify the following: $\frac{5}{x+3} - \frac{(x-1)}{x+3}$ 6. D

- A) $\frac{(4-x)}{(x+3)}$
 B) $\frac{6-x}{(x+3)(x+3)}$
 C) $\frac{6}{(x+3)}$
 D) $\frac{(6-x)}{(x+3)}$ *$\frac{5-x+1}{x+3} = \frac{6-x}{x+3}$*

7. The area of a rectangle is $3x^2 + 7x - 6$ and the width of the rectangle is $x + 3$. What is the simplified expression for the length?

7. B

A) $\frac{1}{3x+2}$

B) $3x - 2$

C) $3x + 2$

D) $\frac{1}{3x-2}$

$$\frac{3x^2 + 7x - 6}{x+3}$$

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

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

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

8. Simplify the following: $\frac{1}{x} = \frac{x}{x+6}$

8. A

A) $x = -2, 3$

B) $x = 2, -3$

C) $x = 2$

D) $x = -3$

$$x+6 = x^2$$

$$x^2 - x - 6 = 0$$

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

$$x = 3 \quad x = -2$$

Part B: Short Answer Questions Complete each of the following in the space provided.

Be sure to show ALL necessary workings. (17 marks)

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

(4 marks)

$$= \frac{x}{(x-4)(x+1)} - \frac{4}{x+1}$$

$$= \frac{x}{(x-4)(x+1)} - \frac{4(x-4)}{(x-4)(x+1)}$$

$$= \frac{x - 4(x-4)}{(x-4)(x+1)}$$

$$= \frac{x - 4x + 16}{(x-4)(x+1)}$$

$$= \frac{-3x + 16}{(x-4)(x+1)}$$

2. Simplify. State all non-permissible values.

(4 marks)

$$\frac{x^2 + 2x - 15}{2x^2 - 5x - 3} \div \frac{3x^2 + 21x + 30}{2x^2 + 3x + 1}$$

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

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

$$2x^2 - 5x - 3$$

$$2x^2 - 6x + x - 3$$

$$2x(x-3) + 1(x-3)$$

$$(2x+1)(x-3)$$

$$2x^2 + 3x + 1$$

$$2x^2 + 2x + x + 1$$

$$2x(x+1) + 1(x+1)$$

$$(2x+1)(x+1)$$

$-1 \quad + \quad -1 \quad 2 \quad 1 \quad 2 \quad -5$ (1)

$$3x^2 + 21x + 30$$

$$3(x^2 + 7x + 10)$$

3. Simplify.

$$\frac{\frac{-2}{x-7} + \frac{4}{x+7}}{\frac{x}{x^2-49} - \frac{2}{x-7}}$$

(4 marks)

$$\begin{aligned} &= \left(\frac{-2}{x-7} + \frac{4}{x+7} \right) \div \left(\frac{x}{x^2-49} - \frac{2}{x-7} \right) \\ &= \frac{-2(x+7) + 4(x-7)}{(x-7)(x+7)} \div \frac{\frac{x}{(x+7)(x-7)} - \frac{2(x+7)}{(x-7)(x+7)}}{1} \\ &= \frac{-2x-14+4x-28}{(x-7)(x+7)} \div \frac{x+2x+14}{(x+7)(x-7)} \\ &= \frac{2x-42}{(x-7)(x+7)} \div \frac{3x+14}{(x+7)(x-7)} \quad \text{cancel!} \\ &= \frac{2x-42}{3x+14} = \frac{2(x-21)}{3x+14} \end{aligned}$$

4. Josh solved the following equation incorrectly. Identify and explain his mistake and find the correct solution. (5 marks)

Never multiplied 1 by the LCD. (1)

$$1 + \frac{2x}{x+4} = \frac{3}{x-1}$$

$$1 + 2x(x-1) = 3(x+4)$$

$$1 + 2x^2 - 2x = 3x + 12$$

$$2x^2 - 5x - 11 = 0$$

$$x = \frac{5 \pm \sqrt{113}}{4}$$

$$\begin{aligned} 1 + \frac{2x}{x+4} &= \frac{3}{x-1} \\ 1(x+4)(x-1) + 2x(x-1) &= 3(x+4) \\ x^2 + 4x - x - 4 + 2x^2 - 2x &= 3x + 12 \\ 3x^2 + x - 4 - 3x - 12 &= 0 \\ 3x^2 - 2x - 16 &= 0 \\ 3x^2 + 6x - 8x - 16 &= 0 \\ 3x(x+2) - 8(x+2) &= 0 \\ (3x-8)(x+2) &= 0 \end{aligned}$$

$$\begin{aligned} p &= 48 \\ s &= 2 \\ &= 8.6 \end{aligned}$$