Math 30-2 Rational Expressions Lesson 1 Practice Questions [Solutions at the end]

1. Given the rational expression, $\frac{x-2}{x+1}$, which statement below is true regarding restrictions?

   A) x ≠ 2 B) x ≠ 0 C) x ≠ -1 D) x ≠ -1, 2

Use the following information to answer the next question.

Expression		Possible NPV Answers			
A	$\frac{x+5}{x-4}$	**1.**	x = -5	**6.**	X = $\frac{4}{3}$
B	$\frac{3x-11}{x^2}$	**2.**	x = $\frac{3}{4}$	**7.**	x = -2
C	$\frac{6x^3}{8x+4}$	**3.**	x = $-\frac{1}{2}$	**8.**	x = $\frac{11}{3}$
D	$\frac{x-10}{4-3x}$	**4.**	x = 0	**9.**	x = 4
		5.	x = 10	**10.**	x = $\frac{1}{2}$

2. Using the numbers 1-10, state the non-permissible values for each expression.
   i) The NPV for expression A is _____.
   ii) The NPV for expression B is _____.
   iii) The NPV for expression C is _____.
   iv) The NPV for expression D is _____.

Use the following information to answer the next question.

An expression equivalent to $\frac{9x+2}{x-1}$, x ≠ 0, 1, is written in the form $\frac{Ax^B+8x^2}{Cx^3-Dx^2}$, where A, B, C, and D represent integers.

3. i) The value of A is _____
   ii) The value of B is _____
   iii) The value of C is _____
   iv) The value of D is _____

4. Which of the following expressions is equivalent to $\frac{6}{4x+7}$, $x \neq -\frac{7}{4}, 0, \frac{7}{4}$?

   A) $\frac{6}{x(4x-7)(4x+7)}$ B) $\frac{6(4x-7)}{x(4x-7)(4x+7)}$

   C) $\frac{6x(4x-7)}{x(4x-7)(4x+7)}$ D) $\frac{6x(4x+7)}{x(4x-7)(4x+7)}$

Use the following information to answer the next question.

Consider the following four rational expressions. Two of the expressions have one non-permissible value, and two of the expressions have two non-permissible values.

Expression 1	$\frac{-4x^2}{2+6x}$
Expression 2	$\frac{3x+12}{3x^2-3}$
Expression 3	$\frac{x+4}{2x-14}$
Expression 4	$\frac{1-5x}{9x(x+1)}$

5. Of the two expressions having two non-permissible values (a total of four numbers), the largest of these is ____.

6. Which of the following is **not** equivalent to $\frac{-12x - 2x^2}{5x}$?

A) $\frac{-(36x + 6x^2)}{15x}$

B) $\frac{-2x - 12}{5}$

C) $\frac{10x^2 - 60x}{50x}$

D) $\frac{-24x - 4x^2}{10x}$

7. Which of the following expressions does not have a non-permissible value?

A) $\frac{2}{x}$

B) $\frac{x-9}{x^2+1}$

C) $\frac{4x}{x^2-4}$

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

8. The rational expression $\frac{kx^2 - 4}{mx + n}$ is an equivalent form of the rational expression $\frac{7x^2 - 1}{9x + 2}$. Which statement below is true, regarding the values of k, m, and n?

A) The largest value is k.

B) The smallest value is m.

C) The sum of the smallest and largest values is 44.

D) The second largest value, or middle value, is 36.

9. In the rational expression, $\frac{x+a}{x(x-k)}$, the non-permissible value(s) of the variable x are

A) 0, -k

B) 0, -a, k

C) 0, k

D) k

10. Simplify $\frac{x+1}{3x+3}$

Math 30-2 Rational Expressions Lesson 1 Practice Question Solutions

1. Given the rational expression, $\frac{x-2}{x+1}$, which statement below is true regarding restrictions?

A) x ≠ 2 B) x ≠ 0 C) x ≠ -1 D) x ≠ -1, 2

Solution

Our task is to determine any values of the variable that would make the denominator equal to zero. A rational expression having a zero denominator is undefined.

Set x + 1 = 0. Isolate x. The non-permissible value is x = -1.

The restriction is x ≠ -1.

Use the following information to answer the next question.

Expression		Possible NPV Answers			
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C	$\frac{6x^3}{8x+4}$	**3.**	x = $-\frac{1}{2}$	**8.**	x = $\frac{11}{3}$
D	$\frac{x-10}{4-3x}$	**4.**	x = 0	**9.**	x = 4
		5.	x = 10	**10.**	x = $\frac{1}{2}$

2. Using the numbers 1-10, state the non-permissible values for each expression.

i) The NPV for expression A is _9_.

ii) The NPV for expression B is _4_.

iii) The NPV for expression C is _3_.

iv) The NPV for expression D is _6_.

Solution

For each **denominator**, set the expression equal to zero and solve for the letter.

Expression A:

$x - 4 = 0$

$x = 4$

Expression B:

$x^2 = 0$

Take the square root of both sides: $x = 0$

Expression C

$8x + 4 = 0$

$8x = -4$

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

Expression D

$4 - 3x = 0$

$4 = 3x$

$x = \frac{4}{3}$

Use the following information to answer the next question.

An expression equivalent to $\frac{9x+2}{x-1}$, $x \neq 0, 1$, is written in the form $\frac{Ax^B + 8x^2}{Cx^3 - Dx^2}$, where A, B, C, and D represent integers.

3. i) The value of A is _36_
   ii) The value of B is _3_
   iii) The value of C is _4_
   iv)The value of D is _4_

Solution

The second term in the numerator of $\frac{Ax^B + 8x^2}{Cx^3 - Dx^2}$ is $8x^2$. The second term in the numerator of $\frac{9x+2}{x-1}$ is 2. To be simplified to 2 means that some term divided into $8x^2$ must be equal to 2. That quantity is $4x^2$.

This means that $\frac{Ax^B}{4x^2} = 9x$. Thus, $Ax^B = 36x^3$. The value of A is 36 and the value of B is 3.

To find C; $\frac{Cx^3}{4x^2} = x$. Thus, $Cx^3 = 4x^3$. The value of C is 4.

To find D; $\frac{Dx^2}{4x^2} = 1$. Thus $Dx^2 = 4x^2$. The value of D is 4.

4. Which of the following expressions is equivalent to $\frac{6}{4x+7}$, $x \neq -\frac{7}{4}, 0, \frac{7}{4}$?

A) $\frac{6}{x(4x-7)(4x+7)}$

B) $\frac{6(4x-7)}{x(4x-7)(4x+7)}$

C) $\frac{6x(4x-7)}{x(4x-7)(4x+7)}$

D) $\frac{6x(4x+7)}{x(4x-7)(4x+7)}$

Solution

The correct answer is C. Dividing out the common binomial of (4x – 7), and the common 'x' in both the numerator and the denominator, will result in the simplification of $\frac{6}{4x+7}$.

Use the following information to answer the next question.

Consider the following four rational expressions. Two of the expressions have one non-permissible value, and two of the expressions have two non-permissible values.

Expression 1	$\frac{-4x^2}{2+6x}$
Expression 2	$\frac{3x+12}{3x^2-3}$
Expression 3	$\frac{x+4}{2x-14}$
Expression 4	$\frac{1-5x}{9x(x+1)}$

5. Of the two expressions having two non-permissible values (a total of four numbers), the largest of these is _1_.

Solution

Expression 1 has 1 NPV. Set the denominator equal to zero and solve for the variable.

$2 + 6x = 0$

$6x = -2$

$x = -\frac{1}{3}$

Expression 2 has 2 NPV's. Factor the denominator and use the zero product property.

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

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

$x = -1, 1$

Expression 3 has 1 NPV. Set the denominator equal to zero and solve for the variable.

2x – 14 = 0

2x = 14

x = 7

Expression 4 has 2 NPV's. Set the denominator equal to zero and use the zero product property.

9x(x + 1) = 0

x = 0, -1

Since the NPV's of expressions 2 and 4 are the only ones to be used to determine the answer, the largest value from these expressions is 1.

6. Which of the following is **not** equivalent to $\frac{-12x-2x^2}{5x}$?

A) $\frac{-(36x+6x^2)}{15x}$

B) $\frac{-2x-12}{5}$

C) $\frac{10x^2-60x}{50x}$

D) $\frac{-24x-4x^2}{10x}$

Solution

The original expression, $\frac{-12x-2x^2}{5x}$, is the same as $\frac{-(12x+2x^2)}{5x}$. If each term is multiplied by 3, we get the expression in A. Thus, A is equivalent to $\frac{-12x-2x^2}{5x}$.

Expression B is equivalent because an 'x' is divided out of each term, and the numerator terms are simply reversed in order.

Expression D is equivalent. Each term in this expression is multiplied by 2.

Expression C is not equivalent. Reverse the order of the numerator terms and factor a common 10 out of each term: $\frac{6x-x^2}{5x}$.

$\frac{6x - x^2}{5x}$ is not the same as $\frac{-12x - 2x^2}{5x}$.

7. Which of the following expressions does not have a non-permissible value?

A) $\frac{2}{x}$ B) $\frac{x-9}{x^2+1}$ C) $\frac{4x}{x^2-4}$ D) $\frac{3(x-8)}{x+5}$

Solution

Expression B does not have a non-permissible value. If the denominator is set equal to zero, $x^2 + 1 = 0$, there is no solution. There is no real number that would make a true statement. The value of 'x' can be any positive number, any negative number, or zero, and still not create a situation where the expression would be undefined.

8. The rational expression $\frac{kx^2 - 4}{mx + n}$ is an equivalent form of the rational expression $\frac{7x^2 - 1}{9x + 2}$. Which statement below is true, regarding the values of k, m, and n?

A) The largest value is k.
B) The smallest value is m.
C) The sum of the smallest and largest values is 44.
D) The second largest value, or middle value, is 36.

Solution

The relationship between the one given numerical value in $\frac{kx^2 - 4}{mx + n}$ (i.e. -4) and the corresponding number in the equivalent expression, $\frac{7x^2 - 1}{9x + 2}$(i.e. -1), is important. The smaller number is multiplied by 4 to get the larger number. Equivalent rational expressions are determined by multiplying (or dividing) every term in the expression by the same quantity. Multiplying each of the numerical values in $\frac{7x^2-1}{9x+2}$ by 4, will determine the values of our letters.

The value of k is 28, the value of m is 36 and the value of n is 8.

The correct answer is C.

9) In the rational expression, $\frac{x+a}{x(x-k)}$, the non-permissible value(s) of the variable x are

A) 0, -k B) 0, -a, k C) 0, k D) k

Solution

Looking only in the denominator, set x(x – k) = 0

Using the zero product property, either x = 0, or x – k = 0. [add k to both sides]

X = 0, or x = k

The non-permissible values are 0 and k.

10) Simplify $\frac{x+1}{3x+3}$

Factor the denominator

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

Divide out the common binomial.

$$= \frac{1}{3}$$