Name: _____

Sec. 12.4: Simplify Rational Expressions

Rational expression: An expression that can be written as a _____ (or division) of two polynomials, with the requirement that the denominator not be ____

Undefined rational expression: A rational expression with a denominator of _____

Excluded value: Any value that causes a rational expression to be _____

Key to simplifying rational expressions: Look for _____ _____ between the numerator and denominator, which will allow canceling.

$$\frac{ac}{bc} = \frac{a}{b}$$

$$\text{E.g.,} \quad \frac{(x+3)(x-2)}{7(x-2)} = \frac{x+3}{7}$$

Examples

Find the excluded values, if any, of the expression.	
1. $\dfrac{5}{x-2}$	2. $\dfrac{x+3}{(x+1)(x-8)}$
3. $(x-5) \div (x^2 - 12x + 32)$	4. $(x + 3) \div (x^2 + 4x + 5)$

Simplify the expression.	
5. $\dfrac{3m}{12m-18}$	6. $(4x) \div (8x^2 + 2x)$
7. $[(k + 3)(k - 1)] \div [(k - 9)(k + 3)]$	8. $(t^2 + 3t) \div (t^2 - 9)$
9. $(q + 4)^2 \div (q^2 - 16)$	10. $(x^2 + 7x + 10) \div (x^2 + 2x - 15)$

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Sec. 12.4 Practice Problems

Simplify each expression.

1) $\dfrac{27n}{54n^3}$

2) $-\dfrac{35r^4}{28r^2}$

3) $\dfrac{90b^2}{60b^3}$

4) $\dfrac{20x}{24x^2}$

Simplify each and state the excluded values.

5) $\dfrac{a-1}{a^2-8a+7}$

6) $\dfrac{n^2-3n-54}{n+6}$

7) $\dfrac{80x^2}{16x^2+40x}$

8) $\dfrac{63v+9}{90}$

9) $\dfrac{8x - 12}{20}$

10) $\dfrac{n + 2}{n^2 - 5n - 14}$

11) $\dfrac{25}{10v + 40}$

12) $\dfrac{4x + 18}{12x^2}$

13) $\dfrac{4m + 16}{4m - 2}$

14) $\dfrac{p^2 - 3p - 54}{p^2 - 3p - 54}$

15) $\dfrac{42n - 24}{12n + 42}$

16) $\dfrac{k^2 - 13k + 36}{8k - 32}$

17) $\dfrac{n^2 - 11n + 10}{n^2 - 7n + 6}$

18) $\dfrac{x^2 - x - 20}{x^2 - x - 20}$

19) $\dfrac{x^2 - 7x - 30}{x^2 - 18x + 80}$

20) $\dfrac{r^2 - 5r - 24}{2r - 16}$

21) $\dfrac{b^2 - 4b - 12}{3b^4 - 12b^2}$

22) $\dfrac{v^3 - 3v^2 + 2v}{v^3 - 5v^2 + 6v}$

23) $\dfrac{18n^2 - 72n + 72}{42n^2 + 54n - 60}$

24) $\dfrac{3x^2 + 12x + 9}{x^2 - 4x - 5}$

Answers to Sec. 12.4 Practice Problems

1) $\dfrac{1}{2n^2}$

2) $-\dfrac{5r^2}{4}$

3) $\dfrac{3}{2b}$

4) $\dfrac{5}{6x}$

5) $\dfrac{1}{a-7}$; $\{7, 1\}$

6) $n - 9$; $\{-6\}$

7) $\dfrac{10x}{2x+5}$; $\left\{0, -\dfrac{5}{2}\right\}$

8) $\dfrac{7v+1}{10}$; No excluded values.

9) $\dfrac{2x-3}{5}$; No excluded values.

10) $\dfrac{1}{n-7}$; $\{7, -2\}$

11) $\dfrac{5}{2(v+4)}$; $\{-4\}$

12) $\dfrac{2x+9}{6x^2}$; $\{0\}$

13) $\dfrac{2(m+4)}{2m-1}$; $\left\{\dfrac{1}{2}\right\}$

14) 1 ; $\{9, -6\}$

15) $\dfrac{7n-4}{2n+7}$; $\left\{-\dfrac{7}{2}\right\}$

16) $\dfrac{k-9}{8}$; $\{4\}$

17) $\dfrac{n-10}{n-6}$; $\{6, 1\}$

18) 1 ; $\{5, -4\}$

19) $\dfrac{x+3}{x-8}$; $\{10, 8\}$

20) $\dfrac{r+3}{2}$; $\{8\}$

21) $\dfrac{b-6}{3b^2(b-2)}$; $\{0, 2, -2\}$

22) $\dfrac{v-1}{v-3}$; $\{0, 3, 2\}$

23) $\dfrac{3(n-2)^2}{(7n-5)(n+2)}$; $\left\{\dfrac{5}{7}, -2\right\}$

24) $\dfrac{3(x+3)}{x-5}$; $\{5, -1\}$