

Simplify Rational Expressions

Introduction to Algebra

ILLUS. 1. Find the value of $\frac{1}{x+1} - \frac{1}{1-x} - \frac{x}{x^2-1}$.

$$\begin{aligned}\frac{1}{x+1} - \frac{1}{1-x} - \frac{x}{x^2-1} &= \frac{1}{x+1} + \frac{1}{x-1} - \frac{x}{x^2-1} \\ &= \frac{x^2-1}{x^2-1} + \frac{x^2-1}{x^2-1} - \frac{x}{x^2-1} \\ &= \frac{x^2-1}{x^2-1}\end{aligned}$$

ILLUS. 2. Find the value of $\frac{1}{(a-b)(b-c)} + \frac{1}{(b-a)(a-c)} + \frac{1}{(c-a)(c-b)}$.

$$\begin{aligned}&\frac{1}{(a-b)(b-c)} + \frac{1}{(b-a)(a-c)} + \frac{1}{(c-a)(c-b)} \\ &= \frac{1}{(a-b)(b-c)} - \frac{1}{(a-b)(a-c)} + \frac{1}{(a-c)(b-c)} \\ &= \frac{a-c}{(a-b)(b-c)(a-c)} - \frac{b-c}{(a-b)(b-c)(a-c)} + \frac{a-b}{(a-b)(b-c)(a-c)} \\ &= \frac{2a-2b}{(a-b)(b-c)(a-c)} \\ &= \frac{2}{(b-c)(a-c)}\end{aligned}$$

Find the value of:

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

2. $\frac{3a}{a^2-9} + \frac{1}{3-a} - \frac{1}{3+a}$.

3. $m^2 - \frac{am^2}{a-m} - \frac{am^2}{m+a} - \frac{2a^2m^2}{m^2-a^2}$.

4. $\frac{20a-4}{4a^2-1} + \frac{3}{1-2a} - \frac{6}{1-2a}$.

5. $\frac{1}{x-y} + \frac{3y^3}{y^3-x^3} - \frac{1}{3(1+a)}$.

6. $\frac{a+3}{6(a^2-1)} + \frac{1}{2(1-a)} + \frac{1}{3(1+a)}$.

7. $\frac{1}{5(3b-y^2)} - \frac{1}{2(3b+y^2)} - \frac{11b-7y^2}{10(y^4-9b^2)}$.

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

9. $\frac{a}{(a-b)(b-c)} + \frac{1}{c-a} - \frac{a-b}{(c-a)(c-b)}$.

10. $\frac{1}{(z-a)(z-y)} + \frac{1}{(a-z)(a-y)} + \frac{1}{(y-z)(y-a)}$.

11. $\frac{1}{(1-x)(1-y)} - \frac{x^2}{(x-1)(y-x)} - \frac{y^2}{(y-1)(x-y)}$.

12. $a - \frac{a^2}{a+1} - \frac{a}{1-a}$.

13. $1 - a + a^2 - a^3 + \frac{a}{1+a}$.

14. $\frac{1}{x^2-7x+12} - \frac{2}{x^2-6x+8} + \frac{2}{x^2-5x+6}$.

15. What will a pounds of rice cost if b pounds costs 43 cents?

16. x is $\frac{4}{9}$ of what number?

17. m is $\frac{5}{x}$ of what number?

18. y is $\frac{a}{b}$ of what number?

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solutions

1. $\frac{2}{x+2}$.

2. $\frac{a}{a^2-9}$.

3. m^2 .

4. $\frac{1}{2a+1}$.

5. $\frac{3y}{x^2+xy+y^2}$.

6. $-\frac{1}{3(a^2-1)}$.

7. $-\frac{b}{5(y^4-9b^2)}$.

8. $\frac{1}{(1-x)(3-x)}$.

9. $\frac{b}{(b-c)(a-b)}$.

10. 0.

11. 1.

12. $\frac{2a^2}{a^2-1}$.

13. $\frac{1+a-a^4}{1+a}$.

14. $\frac{1}{(x-2)(x-3)}$.

15. $\frac{43a}{b}$.

16. $\frac{9x}{4}$.

17. $\frac{mx}{5}$.

18. $\frac{by}{a}$.

Problems from the book:
A First Book in Algebra
Wallace C. Boyd, A.M.
1895

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