

13. Subtract: $\frac{1}{x-1} - \frac{7}{x^2+5x-6}$. And state any excluded values.

a. $\frac{-6}{x+6}$

c. $\frac{-1}{x^2+5x}$

b. $\frac{1}{x+6}$

d. $\frac{-6}{x^2+5x-6}$

14. Simplify $\frac{x^2-x-12}{x^2-16} - \frac{1-2x}{x+4}$. Identify any values for which the expression is undefined.

a. $\frac{2-x}{x+4}$; undefined at $x = -4$ only

c. $\frac{3x+2}{x+4}$; undefined at $x = -4$ only

b. $\frac{2-x}{x+4}$; undefined at $x = -4$ and 4

d. $\frac{3x+2}{x+4}$; undefined at $x = -4$ and 4

15. Multiply the expression and And state any excluded values.

$$(x-1)\left(\frac{x+2}{x^2-1}\right)$$

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

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

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

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

16. Divide the expression And state any excluded values.

$$\frac{x^2+9x+18}{x^2-9} \div \frac{x+6}{x-6}$$

a. $\frac{x-9}{x-3}$

b. $\frac{9x+6}{3}$

c. $\frac{x+3}{x-6}$

d. $\frac{x-6}{x-3}$

17. A board of length $\frac{7}{x+3}$ cm was cut into two pieces. If the length of one piece is $\frac{6}{x-3}$ cm, which expression represents the length of the other piece?

a. $\frac{x-39}{(x+3)^2}$

c. $\frac{x-39}{(x+3)(x-3)}$

b. $\frac{4x-39}{(x+3)(x-3)}$

d. $\frac{4x-39}{(x+3)^2}$

18. What is the numerator when $\frac{2x+4}{x+1} + \frac{5}{x-2}$ is written as a single rational expression?

a. $2x+9$

b. $2x^2+5x-7$

c. $2x-3$

d. $2x^2+5x-3$

Multiple Response

Identify one or more choices that best complete the statement or answer the question.

_____ 19. Which of the following expressions are equivalent to $\frac{6x^2 + x - 2}{2x^2 + 5x - 3}$?

a. $\frac{3x + 2}{x + 3}$

b. $3 + \frac{1}{5} + \frac{2}{3}$

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

d. $3 - \frac{7}{x + 3}$

e. $\frac{3x}{x + 3} + \frac{2}{x + 3}$

f. $\frac{3x - 2}{x - 3}$

Short Answer

20. Divide $(x^3 + x^2 - 20x + 24) \div (x - 3)$

21. Divide $(x^3 - 18x + 8) \div (x - 4)$

22. Write $\frac{2x^2 + 5x + 1}{x + 2}$ as the sum of a quotient and a remainder where the degree of the remainder's numerator is less than that of its denominator.

23. If $\frac{2x^2 + 11x - 23}{x + 7} = 2x + a - \frac{2}{x + 7}$, what is the value of a ? Show your work.

24. Simplify $\left(\frac{x^2 - 16}{x^2 - 6x + 8}\right)\left(\frac{5x - 10}{3x + 12}\right)$. And state any excluded values.

25. Simplify $\frac{2}{x+3} + \frac{3}{x^2 + 7x + 12}$. And state any excluded values.

26. Simplify $\frac{x^2 - 9x - 36}{x^2 - 3x - 18} \div \frac{2x^2 - 21x - 36}{2x^2 + 15x + 18}$. And state any excluded values.

27. Use the rational expression $\frac{2x^2 - 11x + 12}{x^2 - 7x + 12}$.

Part A: Factor the expression. Then simplify, if possible.

Part B: Describe the error in simplifying the rational expression:

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

28. Consider the set of rational expressions that have linear expressions for both the numerator and the denominator. Is this set closed under any operation? Justify your answer with an explanation or a counterexample for each operation.

Problem

29. Claire was asked to evaluate $\frac{x^2 + 8x - 33}{x^2 - 3x - 54} + \frac{x^2 + 17x + 66}{x^2 - 12x + 27}$ when $x = 0$, $x = -2$, and $x = 4$. To avoid having to evaluate four quadratic polynomials multiple times, Claire decided to simplify the expression before evaluating it for the first value of x . Her work is shown below.

$$\begin{aligned} \frac{x^2 + 8x - 33}{x^2 - 3x - 54} + \frac{x^2 + 17x + 66}{x^2 - 12x + 27} &= \frac{(x+11)(x-3)}{(x+6)(x-9)} + \frac{(x+6)(x+11)}{(x-3)(x-9)} \\ &= \frac{(x+6)(x-9)}{(x+11)(x-3)} \cdot \frac{(x+6)(x+11)}{(x-3)(x-9)} \\ &= \frac{(x+6)^2}{(x-3)^2} \end{aligned}$$

Now substitute 0 for x in the simplified expression $\frac{(x+6)^2}{(x-3)^2}$.

$$\begin{aligned} \frac{(0+6)^2}{(0-3)^2} &= \frac{6^2}{(-3)^2} \\ &= \frac{36}{9} \\ &= 4 \end{aligned}$$

- Explain how you can tell that Claire made a mistake by evaluating the original expression when $x = 0$.
- Describe Claire's mistake.
- Simplify the expression correctly. Show your work.

Other

30. For the rational expressions $p(x) = \frac{x}{x+1}$ and $q(x) = \frac{1}{x+1}$, determine whether the result of performing each of the following operations is another rational expression.

- $p(x) + q(x)$ Yes No
- $p(x) - q(x)$ Yes No
- $p(x) \cdot q(x)$ Yes No
- $\frac{p(x)}{q(x)}$ Yes No
- $\frac{q(x)}{p(x)}$ Yes No