

3-1 Practice: Simplifying, Multiplying, and Dividing**Simplify each and state the excluded values.**

1) $-\frac{32x^3}{24x^2}$

3) $\frac{2v-16}{v-8}$

5) $\frac{3b+18}{b^2+7b+6}$

7) $\frac{5n^2+6n-27}{5n^2+18n+9}$

2) $\frac{n+9}{3n^2+27n}$

4) $\frac{8x+20}{24}$

6) $\frac{2v^3+6v^2}{v^2+6v+9}$

8) $\frac{9x+90}{9x^2+81x-90}$

Simplify each expression by either multiplying or dividing. Remember to state the excluded values.

9. $\frac{x^2-x-2}{x^2-1}$

10. $\frac{4x-12}{x-2} \cdot \frac{x^2-4}{x-3}$

11. $\frac{y^2-16}{y^2+8y+16} \cdot \frac{3y^2-5y-2}{y^2-6y+8}$

12. $\frac{y^2+10y+25}{y^2-9} \cdot \frac{y+3}{y+5}$

13. $\frac{5x^2+10x-75}{4x^2-24x-28} \cdot \frac{2x^2-10x-28}{x^2+7x+10}$

14. $\frac{6x+12}{x} \div \frac{x+2}{x^3}$

15. $\frac{x^2-16}{x^2-10x+25} \div \frac{3x-12}{x^2-3x-10}$

16. $\frac{y^2-y-6}{y^2-5y-14} \cdot \frac{y^2+6y+5}{y^2-6y-7}$

17. $\frac{x^2-x-12}{x^2-2x-15} \cdot \frac{x^2+8x+12}{x^2-5x-14}$

18. $\frac{x-4}{x^2-4} \div \frac{x^2-3x-4}{x^2+5x+6}$

3-2 Practice: Adding and Subtracting Rational Expressions**Perform the operation and simplify. Don't forget to state the excluded values.**

1. $\frac{16+x}{5x} - \frac{11-4x}{5x}$

2. $\frac{10}{b} + \frac{1}{10b}$

3. $\frac{1}{6u^2} - \frac{2}{9u}$

4. $\frac{1}{y-6} + \frac{y}{6-y}$

5. $\frac{x}{x+3} - \frac{5}{x-2}$

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

7. $\frac{5}{2} - \frac{1}{2x} - \frac{3}{x+1}$

8. $\frac{y-2}{4y+8} - \frac{y+6}{5y+10}$

9. $\frac{x}{x^2-9} + \frac{3}{x^2-5x+6}$

10. $\frac{\frac{5}{x}}{\frac{x}{y}}$

11. $\frac{\frac{1}{2}}{3 + \frac{1}{x}}$

12. $\frac{\frac{3}{x} + \frac{4}{y}}{\frac{4}{x} - \frac{3}{y}}$

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

14. $\frac{x}{x^2-x-20} + \frac{2}{x+4}$

15. $\frac{1}{x^2-9x+20} - \frac{5}{x^2-10x+25}$

16. $\frac{3}{x} - \frac{8}{-x}$

17. $\frac{r^2}{r-t} + \frac{t^2}{t-r}$

18. $\frac{x}{x^2-x-30} - \frac{1}{x+5}$

19. $\frac{m}{m^2-4} + \frac{2}{3m+6}$

20. $\frac{x-4}{x^2+2x-8} - \frac{x+2}{x^2-16}$

REVIEW!21. Divide $f(x)$ by $d(x)$ using long division and write a summary statement in fraction form.

$$f(x) = x^3 - 1 \quad d(x) = x + 1$$

22. Divide using synthetic division. Write a summary statement using fraction form.

$$\frac{3x^4 + x^3 - 4x^2 + 9x - 3}{x+5}$$

23. Use the Remainder Theorem to find the remainder when $f(x)$ is divided by $x - k$.

$$f(x) = x^3 - 3x + 4 \quad k = -2$$

24. Use Rational Roots Theorem to write a list of all possible rational zeros.

$$f(x) = 6x^3 - 5x - 18$$

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3-3 Practice: Solving Rational Expressions and Applications

Solve the equation. Don't forget to state the extraneous solutions, if any.

1. $\frac{x-2}{3} + \frac{x+5}{3} = \frac{1}{3}$

2. $x + 2 = \frac{15}{x}$

3. $x + \frac{4x}{x-3} = \frac{12}{x-3}$

4. $\frac{3x}{x+5} + \frac{1}{x-2} = \frac{7}{x^2+3x-10}$

5. $\frac{x-3}{x} - \frac{3}{x+1} + \frac{3}{x^2+x} = 0$

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

7. Consider all rectangles with an area of 182 ft^2 . Let x be the length of one side of such a rectangle.

- Express the perimeter P as a function of x .
- Find the dimensions of the rectangle that has the least perimeter. What is the least perimeter?

8. You can travel 40 mi on your motorbike in the same time it takes your friend to travel 15 mi on his bicycle. Considering your friend rides his bike 20mi/h slower than you ride your motorbike, find the speed for each bike.

9. An airplane flies from its home airport to a city 510 mi away and then back. The total flying time for the round-trip flight is 3.9 hours. The plane travels the first half of the trip at 225 mi/h with no wind.

- How strong is the wind on the return flight? Round your answer to the nearest tenth.
- Is the wind on the return flight a headwind or a tailwind?

STAMP QUESTION

10. The total electrical resistance R of two resistors connected in parallel with resistances R_1 and R_2 is given by: $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$

One resistor has a resistance of 2.3 ohms. Let x be the resistance of the second resistor.

- Express the total resistance R as a function of x .
- Find the resistance of the second resistor if the total resistance of the pair is 1.7 ohms.

REVIEW!

11. State the degree and list the zeros of the polynomial function. State the multiplicity of each zero and whether the graph crosses the x -axis at the corresponding x -intercept. Then sketch the graph by hand.

$$f(x) = 4(x - 3)^6(x + 8)^4$$

Rational Operations Review**Simplify each and state the excluded values.**

1.
$$\frac{5m^2 + 41m - 90}{7m^2 + 62m - 80}$$

2.
$$\frac{2v^2}{3} \cdot \frac{v^2 - 9v + 18}{2v^3 - 12v^2}$$

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

4.
$$\frac{2b}{4b^3 + 16b^2} + \frac{4}{b - 4}$$

5.
$$\frac{\frac{9}{x + 1} + \frac{x + 1}{9}}{\frac{x + 1}{3}}$$

6.
$$\frac{5}{n - 3} - \frac{3}{n - 2}$$

Solve the following rational equations. Remember to check your answers.

7.
$$\frac{x - 4}{x - 2} = \frac{x - 2}{x + 2} + \frac{1}{x - 2}$$

8. Carl decides to explore Provo River. He canoes downstream 5 miles to check out Bridal Veil Falls. Finding that it was dried up, he immediately turns around, retraces his route (this time traveling upstream against the current). He returns to his beginning point 3 hours after he left. If Carl canoes at a rate of 6 miles per hour in still water, how fast was the Provo River flowing on that day?