

7 Chapter Review WITH CalcChat®



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Chapter Learning Target

Understand rational functions.

Chapter Success Criteria

- ◆ I can determine whether an equation represents direct variation or inverse variation.
- ◆ I can graph rational functions.
- I can add, subtract, multiply, and divide rational expressions.
- I can solve rational equations.

◆ Surface
■ Deep

SELF-ASSESSMENT 1 I do not understand. 2 I can do it with help. 3 I can do it on my own. 4 I can teach someone else.

7.1 Inverse Variation (pp. 355–360)



Learning Target: Understand inverse variation.

Tell whether x and y show *direct variation*, *inverse variation*, or *neither*.

1. $xy = 5$

2. $5y = 6x$

3. $15 = \frac{x}{y}$

4. $y - 3 = 2x$

5.

x	7	11	15	20
y	35	55	75	100

6.

x	5	8	10	20
y	6.4	4	3.2	1.6

The variables x and y vary inversely. Use the given values to write an equation relating x and y . Then find y when $x = -3$.

7. $x = 1, y = 5$

8. $x = -4, y = -6$

9. $x = \frac{5}{2}, y = 18$

10. $x = -12, y = \frac{2}{3}$

Vocabulary



direct variation
constant of variation
inverse variation

7.2 Graphing Rational Functions (pp. 361–368)



Learning Target: Describe and graph rational functions.

Graph the function. State the domain and range.

11. $y = \frac{4}{x-3}$

12. $y = \frac{1}{x+5} + 2$

13. $f(x) = \frac{3x-2}{x-4}$

14. $y = -\frac{1}{x} - 1$

15. A teacher orders tablet stands. There is a delivery fee of \$10 and each stand costs \$2. How many stands must the teacher buy for the average cost per stand to fall to \$2.50?

Vocabulary



rational function





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7.3 Multiplying and Dividing Rational Expressions (pp. 369–376)**Learning Target:** Multiply and divide rational expressions.

Find the product or quotient.

16. $\frac{80x^4}{y^3} \cdot \frac{xy}{5x^2}$

17. $\frac{x-3}{2x-8} \cdot \frac{6x^2-96}{x^2-9}$

18. $\frac{16x^2-8x+1}{x^3-7x^2+12x} \div \frac{20x^2-5x}{15x^3}$

19. $\frac{x^2-13x+40}{x^2-2x-15} \div (x^2-5x-24)$

20. Find an expression that completes the equation below.

$$\frac{3-x}{x^2+3x-18} \div \frac{\text{■}}{x^2+7x+6} = x+1$$

21. What is the domain of $g(x) = \frac{2+x}{8-2x^2}$?**Vocabulary** rational expression
simplified form of a
rational expression**7.4** Adding and Subtracting Rational Expressions (pp. 377–384)**Learning Target:** Add and subtract rational expressions.

Find the sum or difference.

22. $\frac{5}{6(x+3)} + \frac{x+4}{2x}$

23. $\frac{5x}{x+8} + \frac{4x-9}{x^2+5x-24}$

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

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

Rewrite the function in the form $g(x) = \frac{a}{x-h} + k$. Graph the function. Describe the graph of g as a transformation of the graph of $f(x) = \frac{a}{x}$.

26. $g(x) = \frac{5x+1}{x-3}$

27. $g(x) = \frac{4x+2}{x+7}$

28. $g(x) = \frac{9x-10}{x-1}$

29. $g(x) = \frac{-1}{2+x}$

30. Let f be the focal length of a thin camera lens, p be the distance between the lens and an object being photographed, and q be the distance between the lens and the film. For the photograph to be in focus, the variables should satisfy the lens equation to the right. Simplify the complex fraction.

$$f = \frac{1}{\frac{1}{p} + \frac{1}{q}}$$

31. Members of a student council prepare banners, balloons, and party bags for a school celebration. The table shows the rates of completion for the requested materials. Write a model in simplified form for the total time (in minutes) it takes to prepare the materials.

	Number	Rate (objects per minute)
Banners	10	x
Balloons	50	$x-10$
Party Bags	80	$x+5$

7.5 Solving Rational Equations (pp. 385–392)



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Learning Target: Solve rational equations.

Solve the equation. Check your solution(s).

32. $\frac{5}{x} = \frac{7}{x+2}$

33. $\frac{8(x-1)}{x^2-4} = \frac{4}{x+2}$

34. $\frac{2(x+7)}{x+4} - 2 = \frac{2x+20}{2x+8}$

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

Determine whether the inverse of f is a function. Then find the inverse.

36. $f(x) = \frac{3}{x+6}$

37. $f(x) = \frac{10}{x-7}$

38. $f(x) = \frac{1}{x} + 8$

39. $f(x) = \frac{x}{1-x}$

40. You play 30 levels of a video game and achieve an expert rating in 11 of those levels. Solve the equation $0.5 = \frac{11+x}{30+x}$ to find the number of consecutive expert ratings you need to achieve so that you have achieved an expert rating on half of the levels you have played.

41. A nonprofit charges \$50 to host a benefit walk at your school plus \$20 for each participant. Determine how many people must participate for the average cost per person to fall to \$25.

42. Find the extraneous solution of the equation $\frac{1}{x-6} + \frac{x}{x-2} = \frac{4}{x^2-8x+12}$. Explain why the solution is extraneous.



Mathematical Practices

Reason Abstractly and Quantitatively

Mathematically proficient students make sense of quantities and their relationships in problem situations.

- In Exercise 47 on page 383, you calculated a monthly payment M for a given principal and interest rate. In general, what happens to the value of M when you double P ? Explain your reasoning.
- In Example 7 on page 373, total healthcare expenditures over time is described by a function. How does this model change if E were given in billions?
- Consider the function $c(x) = \frac{ax+b}{x}$ where $c(x)$ is the average cost of purchasing x items for a dollars per item with an initial fee of b dollars. Create an average cost function for a situation for which the average cost is within 10 cents of \$50 after about 40 items are purchased. How do the relationships between a , b , and x affect your model?