7.2 Exercises

In Exercises 1-12, reduce each rational number to lowest terms by applying the following steps:

i. Prime factor both numerator and denominator.
ii. Cancel common prime factors.
iii. Simplify the numerator and denominator of the result.

1. \( \frac{147}{98} \)
2. \( \frac{3087}{245} \)
3. \( \frac{1715}{196} \)
4. \( \frac{225}{50} \)
5. \( \frac{1715}{441} \)
6. \( \frac{56}{24} \)
7. \( \frac{108}{189} \)
8. \( \frac{75}{500} \)
9. \( \frac{100}{28} \)
10. \( \frac{98}{147} \)
11. \( \frac{1125}{175} \)
12. \( \frac{3087}{8575} \)

In Exercises 13-18, reduce the given expression to lowest terms. State all restrictions.

13. \( \frac{x^2 - 10x + 9}{5x - 5} \)
14. \( \frac{x^2 - 9x + 20}{x^2 - x - 20} \)
15. \( \frac{x^2 - 2x - 35}{x^2 - 7x} \)
16. \( \frac{x^2 - 15x + 54}{x^2 + 7x - 8} \)
17. \( \frac{x^2 + 2x - 63}{x^2 + 13x + 42} \)
18. \( \frac{x^2 + 13x + 42}{9x + 63} \)

In Exercises 19-24, negate any two parts of the fraction, then factor (if necessary) and cancel common factors to reduce the rational expression to lowest terms. State all restrictions.

19. \( \frac{x + 2}{-x - 2} \)
20. \( \frac{4 - x}{x - 4} \)
21. \( \frac{2x - 6}{3 - x} \)
22. \( \frac{3x + 12}{-x - 4} \)
23. \( \frac{3x^2 + 6x}{-x - 2} \)

1 Copyrighted material. See: http://msenux.redwoods.edu/IntAlgText/
24. \[
\frac{8x - 2x^2}{x - 4}
\]

In Exercises 25-38, reduce each of the given rational expressions to lowest terms. State all restrictions.

25. \[
\frac{x^2 - x - 20}{25 - x^2}
\]
26. \[
\frac{x - x^2}{x^2 - 3x + 2}
\]
27. \[
\frac{x^2 + 3x - 28}{x^2 + 5x - 36}
\]
28. \[
\frac{x^2 + 10x + 9}{x^2 + 15x + 54}
\]
29. \[
\frac{x^2 - x - 56}{8x - x^2}
\]
30. \[
\frac{x^2 - 7x + 10}{5x - x^2}
\]
31. \[
\frac{x^2 + 13x + 42}{x^2 - 2x - 63}
\]
32. \[
\frac{x^2 - 16}{x^2 - x - 12}
\]
33. \[
\frac{x^2 - 9x + 14}{49 - x^2}
\]
34. \[
\frac{x^2 + 7x + 12}{9 - x^2}
\]
35. \[
\frac{x^2 - 3x - 18}{x^2 - 6x + 5}
\]
36. \[
\frac{x^2 + 5x - 6}{x^2 - 1}
\]
37. \[
\frac{x^2 - 3x - 10}{-9x - 18}
\]
38. \[
\frac{x^2 - 6x + 8}{16 - x^2}
\]

In Exercises 39-42, reduce each rational function to lowest terms, and then perform each of the following tasks.

i. Load the original rational expression into Y1 and the reduced rational expression (your answer) into Y2 of your graphing calculator.

ii. In TABLE SETUP, set TblStart equal to zero, \(\Delta Tbl\) equal to 1, then make sure both independent and dependent variables are set to Auto. Select TABLE and scroll with the up- and down-arrows on your calculator until the smallest restriction is in view. Copy both columns of the table onto your homework paper, showing the agreement between Y1 and Y2 and what happens at all restrictions.

39. \[
\frac{x^2 - 8x + 7}{x^2 - 11x + 28}
\]
40. \[
\frac{x^2 - 5x}{x^2 - 9x}
\]
41. \[
\frac{8x - x^2}{x^2 - x - 56}
\]
42. \[
\frac{x^2 + 13x + 40}{-2x - 16}
\]

Given \(f(x) = 2x + 5\), simplify each of the expressions in Exercises 43-46. Be sure to reduce your answer to lowest terms and state any restrictions.

43. \[
\frac{f(x) - f(3)}{x - 3}
\]
44. \[
\frac{f(x) - f(6)}{x - 6}
\]
45. \[
\frac{f(x) - f(a)}{x - a}
\]
46. \[
\frac{f(a + h) - f(a)}{h}
\]
Given \( f(x) = x^2 + 2x \), simplify each of the expressions in **Exercises 47-50**. Be sure to reduce your answer to lowest terms and state any restrictions.

47. \( \frac{f(x) - f(1)}{x - 1} \)

48. \( \frac{f(x) - f(a)}{x - a} \)

49. \( \frac{f(a + h) - f(a)}{h} \)

50. \( \frac{f(x + h) - f(x)}{h} \)

**Drill for Skill.** In **Exercises 51-54**, evaluate the given function at the given expression and simplify your answer.

51. Suppose that \( f \) is the function

\[
f(x) = -\frac{x - 6}{8x + 7}.
\]

Evaluate \( f(-3x + 2) \) and simplify your answer.

52. Suppose that \( f \) is the function

\[
f(x) = -\frac{5x + 3}{7x + 6}.
\]

Evaluate \( f(-5x + 1) \) and simplify your answer.

53. Suppose that \( f \) is the function

\[
f(x) = -\frac{3x - 6}{4x + 6}.
\]

Evaluate \( f(-x - 3) \) and simplify your answer.

54. Suppose that \( f \) is the function

\[
f(x) = \frac{4x - 1}{2x - 4}.
\]

Evaluate \( f(5x) \) and simplify your answer.
7.2 Answers

1. \( \frac{3}{2} \)

3. \( \frac{35}{4} \)

5. \( \frac{35}{9} \)

7. \( \frac{4}{7} \)

9. \( \frac{25}{7} \)

11. \( \frac{45}{7} \)

13. \( \frac{x - 9}{5} \), provided \( x \neq 1 \)

15. \( \frac{x + 5}{x} \), provided \( x \neq 0, 7 \)

17. \( \frac{(x - 7)(x + 9)}{(x + 7)(x + 6)} \), provided \( x \neq -7, -6 \)

19. \( -1 \), provided \( x \neq -2 \)

21. \( -2 \), provided \( x \neq 3 \)

23. \( -3x \), provided \( x \neq -2 \)

25. \( \frac{x + 4}{x + 5} \), provided \( x \neq -5, 5 \)

27. \( \frac{x + 7}{x + 9} \), provided \( x \neq 4, -9 \)

29. \( \frac{x + 7}{x} \), provided \( x \neq 0, 8 \)

31. \( \frac{x + 6}{x - 9} \), provided \( x \neq -7, 9 \)

33. \( \frac{-x - 2}{x + 7} \), provided \( x \neq 7, -7 \)

35. \( \frac{(x - 6)(x + 3)}{(x - 1)(x - 5)} \), provided \( x \neq 1, 5 \)

37. \( \frac{-x - 5}{9} \), provided \( x \neq -2 \)

39. \( \frac{x - 1}{x - 4} \), provided \( x \neq 7, 4 \)

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<th>Y1</th>
<th>Y2</th>
</tr>
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<tr>
<td>7</td>
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<td>2</td>
</tr>
<tr>
<td>8</td>
<td>1.75</td>
<td>1.75</td>
</tr>
</tbody>
</table>
41. \( -\frac{x}{x+7}, \) provided \( x \neq -7, 8 \)

<table>
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<th>Y2</th>
</tr>
</thead>
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</tbody>
</table>

43. 2, provided \( x \neq 3 \)

45. 2, provided \( x \neq a \)

47. \( x + 3, \) provided \( x \neq 1 \)

49. \( 2a + h + 2, \) provided \( h \neq 0 \)

51. \( \frac{3x + 4}{24x - 23} \)

53. \( \frac{3x + 15}{4x + 6} \)