

# Solving Rational Equations

## Starter Level

Solve these rational equations, leaving your answers exact, or to 3 s. f.

4  $\frac{x+3}{6} + \frac{2x}{5} = \frac{5x}{2}$

2  $\frac{5x-9}{6} + \frac{2x-4}{7} = 1$

3  $\frac{2x}{7} - \frac{1}{3} = \frac{x}{2}$

5  $\frac{2x-1}{4} - \frac{x+4}{3} = \frac{5x}{6}$

6  $\frac{4x+1}{2} + \frac{3x-5}{5} = \frac{2x-2}{4}$

8  $\frac{5x}{3} - \frac{4x-1}{8} = \frac{x+2}{6} - \frac{x+1}{12}$

## problem solving

9  $\frac{2}{x} - \frac{3x}{4} = \frac{1}{3}$

## Answers

1  $\frac{40}{17}$

2  $\frac{129}{47}$

3  $-\frac{14}{9}$

4  $\frac{15}{58}$

5  $-\frac{19}{8}$

6 0

7  $\frac{73}{29}$

8  $\frac{3}{26}$

9 1.426, -1.870 (3 d.p.)

## Intermediate Level

Solve these rational equations using appropriate equivalence transformations, and check your answers algebraically. Make sure you check for extraneous solutions.

1  $\frac{4}{x} = \frac{9}{x-2}$

2  $\frac{10}{x+4} = \frac{15}{4(x+1)}$

3  $\frac{6}{3x} + \frac{5}{4} = \frac{3}{x}$

4  $\frac{4}{3x} + \frac{5}{4} = \frac{3}{x}$

6  $\frac{5}{x-2} = 7 + \frac{10}{x-2}$

7  $\frac{3}{x-2} + \frac{2}{2-x} = 2-x$

8  $x+1 = \frac{72}{x}$

9  $x + \frac{3}{x+1} = 4$

## Answers

1  $-\frac{8}{5}$

2  $\frac{4}{5}$

3  $\frac{4}{5}$

4  $\frac{4}{3}$

5 No solutions,  $x = 2$  is an extraneous solution

6  $\frac{9}{7}$

7 No solutions,  $x = 2$  is an extraneous solution

8 8, -9

9 3.303, -0.303 (3 d.p.)

## Upper Intermediate Level

Solve all rational equations. Check and disqualify any extraneous solutions.

$$4 \quad \frac{2}{x^2 - x} = \frac{1}{x - 1}$$

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

$$1 \quad \frac{5}{x - 2} - \frac{4}{x} = \frac{10}{x(x - 2)}$$

$$2 \quad \frac{4}{x} = \frac{3}{x - 2}$$

$$3 \quad \frac{10}{x^2 - 2x} = \frac{5}{x - 2} - \frac{4}{x}$$

$$4 \quad \frac{2x^2 - 5}{x^2 - 4} + \frac{6}{x + 2} = \frac{4x - 7}{x - 2}$$

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

$$6 \quad \frac{x}{x^2 - 8} = \frac{2}{x}$$

## Answers

4 2

5 -6

1 No solutions,  $x = 2$  is an extraneous solution

2 8

3 No solutions,  $x = 2$  is an extraneous solution

4 1, 1.5

5  $\frac{8}{5}$

6  $\pm 4$

Challenge Level  
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$$39. \frac{x+2}{x^2-6x-27} + \frac{x-17}{x^2-2x-63} = \frac{x+1}{x^2+10x+21}$$

$$41. \frac{3x-2}{x^2-17x+72} - \frac{x-4}{x^2-20x+96} = \frac{x-6}{x^2-21x+108}$$

$$43. \frac{x+3}{x^2-6x-16} + \frac{x-14}{x^2-4x-32} = \frac{x+1}{x^2+6x+8}$$

$$45. \frac{x-4}{x-7} + \frac{x-5}{x-6} = \frac{x+164}{x^2-13x+42}$$

$$47. \frac{x+5}{x^2-6x-27} + \frac{x-17}{x^2-18x+77} = \frac{x+1}{x^2-14x+33}$$

$$49. \frac{3x-4}{x^2-10x+21} - \frac{x-8}{x^2-18x+77} = \frac{x-5}{x^2-14x+33}$$

$$40. \frac{x+3}{x^2-6x-16} + \frac{x-14}{x^2-4x-32} = \frac{x+1}{x^2+6x+8}$$

$$42. \frac{3x-3}{x^2-13x+40} - \frac{x-6}{x^2-22x+112} = \frac{x-9}{x^2-19x+70}$$

$$44. \frac{x-6}{x-4} + \frac{x-7}{x-3} = \frac{x+111}{x^2-7x+12}$$

$$46. \frac{x-4}{x-8} + \frac{x-5}{x-7} = \frac{x+143}{x^2-15x+56}$$

$$48. \frac{x+7}{x^2-3x-18} + \frac{x-17}{x^2-x-30} = \frac{x+1}{x^2+8x+15}$$

$$50. \frac{3x-3}{x^2-13x+40} - \frac{x-7}{x^2-19x+70} = \frac{x-2}{x^2-22x+112}$$