

Solving Rational Equations

Solve.

1.
$$\frac{3}{4n} + \frac{1}{n} = \frac{7}{8}$$

$$\frac{6}{8n} + \frac{8}{8n} = \frac{7n}{8n}$$

$$14 = 7n$$

$$\underline{n = 2}$$

2.
$$\frac{2}{3n} + \frac{4}{n} = \frac{7}{9}$$

$$\frac{6}{9n} + \frac{36}{9n} = \frac{7n}{9n}$$

$$42 = 7n$$

$$\underline{n = 6}$$

3.
$$\frac{6-x}{4-x} = \frac{3}{5}$$

$$\frac{5(6-x)}{5(4-x)} = \frac{3(4-x)}{5(4-x)}$$

$$30 - 5x = 12 - 3x$$

$$18 = 2x$$

$$\underline{x = 9}$$

4.
$$\frac{2x-5}{8x-5} = \frac{1}{4}$$

$$\frac{4(2x-5)}{4(8x-5)} = \frac{8x-5}{4(8x-5)}$$

$$8x - 20 = 8x - 5$$

$$-20 = -5$$

No Solution

5.
$$\frac{x-4}{x-2} = 2$$

$$\frac{x-4}{x-2} = \frac{2(x-2)}{(x-2)}$$

$$x - 4 = 2x - 4$$

$$\underline{x = 0}$$

6.
$$\frac{2x-4}{x-2} = 3$$

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

$$2x - 4 = 3x - 6$$

$$\underline{x = 2}$$

$$7. \quad \frac{3}{2n+1} - \frac{6}{4n+2} = 0$$

$$\frac{2(3)}{2(2n+1)} - \frac{6}{2(2n+1)} = 0$$

$$6 - 6 = 0$$

All Real Numbers

$$8. \quad \frac{3}{2x-1} = \frac{7}{4x-2}$$

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

$$6 = 7$$

No Solution

$$9. \quad \frac{3x+5}{6} - \frac{10}{x} = \frac{x}{2}$$

$$\frac{x(3x+5)}{6x} - \frac{6(10)}{6x} = \frac{3x(x)}{6x}$$

$$3x^2 + 5x - 60 = 3x^2$$

$$5x = 60$$

$$\underline{x = 12}$$

$$10. \quad \frac{5}{1+y} - \frac{3}{1-y} = 2$$

$$\frac{5(1-y)}{(1+y)(1-y)} - \frac{3(1+y)}{(1+y)(1-y)} = \frac{2(1+y)(1-y)}{(1+y)(1-y)}$$

$$5 - 5y - 3 - 3y = 2 - 2y^2$$

$$2 - 8y = 2 - 2y^2$$

$$2y^2 - 8y = 0$$

$$2y(y - 4) = 0$$

$$\underline{y = 0, 4}$$

$$11. \quad \frac{1}{y-3} = \frac{6}{y^2-9}$$

$$\frac{1}{y-3} = \frac{6}{(y-3)(y+3)}$$

$$\frac{1(y+3)}{(y-3)(y+3)} = \frac{6}{(y-3)(y+3)}$$

$$y+3 = 6$$

$$y = 3 \quad \therefore \underline{\text{No Solution}}$$

$$12. \quad \frac{n-2}{n} - \frac{n-3}{n-6} = \frac{1}{n}$$

$$\frac{(n-2)(n-6)}{n(n-6)} - \frac{n(n-3)}{n(n-6)} = \frac{1(n-6)}{n(n-6)}$$

$$n^2 - 8n + 12 - n^2 + 3n = n - 6$$

$$-6n = -18$$

$$\underline{n = 3}$$

$$13. \quad \frac{1}{2x-1} - \frac{3}{4x^2-1} = 0$$

$$\frac{1}{2x-1} - \frac{3}{(2x-1)(2x+1)} = 0$$

$$\frac{1(2x+1)}{2x-1} - \frac{3}{(2x-1)(2x+1)} = 0$$

$$2x+1-3=0$$

$$x=1$$

$$14. \quad \frac{1}{y^2-y} + \frac{1}{1-y} = \frac{1}{2}$$

$$\frac{1}{y(y-1)} + \frac{1}{-(y-1)} = \frac{1}{2}$$

$$\frac{1(-2)}{-2y(y-1)} + \frac{1(2y)}{-2y(y-1)} = \frac{1(-y^2+y)}{-2y(y-1)}$$

$$-2+2y+y^2-y=0$$

$$y^2+y-2=0$$

$$(y+2)(y-1)=0$$

$$y=-2, 1$$

$$15. \quad \frac{1}{x-4} + \frac{2}{x^2-16} = \frac{3}{x+4}$$

$$\frac{1}{x-4} + \frac{2}{(x-4)(x+4)} = \frac{3}{x+4}$$

$$\frac{1(x+4)}{(x-4)(x+4)} + \frac{2}{(x-4)(x+4)} = \frac{3(x-4)}{(x-4)(x+4)}$$

$$x+4+2=3x-12$$

$$18=2x$$

$$x=9$$

$$16. \quad \frac{3a}{a-1} - \frac{4}{a+1} = \frac{4}{a^2-1}$$

$$\frac{3a}{a-1} - \frac{4}{a+1} = \frac{4}{(a-1)(a+1)}$$

$$\frac{3a(a+1)}{(a-1)(a+1)} - \frac{4(a-1)}{(a-1)(a+1)} = \frac{4}{(a-1)(a+1)}$$

$$3a^2+3a-4a+4=4$$

$$3a^2-a=0$$

$$a(3a-1)=0$$

$$a=0, \frac{1}{3}$$

$$17. \quad \frac{x-2}{x^2-x-6} = \frac{1}{x^2-4} + \frac{3}{2x+4}$$

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

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

$$2(x^2 - 4x + 4) = 2x - 6 + 3(x^2 - 5x + 6)$$

$$2x^2 - 8x + 8 = 2x - 6 + 3x^2 - 15x + 18$$

$$x^2 - 5x + 4 = 0$$

$$(x-4)(x-1) = 0$$

$$x = 1, 4$$

$$18. \quad \frac{x}{x+1} - \frac{x+1}{x-4} = \frac{5}{x^2-3x-4}$$

$$\frac{x}{x+1} - \frac{x+1}{x-4} = \frac{5}{(x-4)(x+1)}$$

$$\frac{x(x-4)}{(x-4)(x+1)} - \frac{(x+1)(x+1)}{(x-4)(x+1)} = \frac{5}{(x-4)(x+1)}$$

$$x^2 - 4x - x^2 - 2x - 1 = 5$$

$$-6x = 6$$

$$x = \cancel{1} \quad \therefore \underline{\text{No Solution}}$$