

C8L6 Notes

Rational Equations

Solve. Indicate any excluded values.

1. $\frac{1}{x+5} + \frac{2}{x-5} = \frac{4}{x^2-25}$

$$\frac{1}{x+5} + \frac{2}{x-5} = \frac{4}{(x+5)(x-5)}$$
$$\frac{1(x-5)}{(x+5)(x-5)} + \frac{2(x+5)}{(x+5)(x-5)} = \frac{4}{(x+5)(x-5)}$$
$$x-5+2x+10=4$$
$$3x-5=4$$
$$3x=9$$
$$x=3; x \neq 5, -5$$

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

$$\frac{x(x+3)}{(x-7)(x+3)} + \frac{4x(x-7)}{(x-7)(x+3)} = \frac{5(x-7)(x+3)}{(x-7)(x+3)}$$
$$x^2+3x+4x^2-28x=5(x^2-4x-21)$$
$$5x^2-25x=5x^2-20x-105$$
$$-25x=-20x-105$$
$$-5x=-105$$
$$x=21; x \neq 7, -3$$

3. $\frac{1}{a^2-a-30} = \frac{1}{a-6} - \frac{3}{a^2-a-30}$

$$\frac{1}{(a-6)(a+5)} = \frac{1(a+5)}{(a-6)(a+5)} - \frac{3}{(a-6)(a+5)}$$
$$1 = a+5-3$$
$$1 = a+2$$
$$-1 = a; a \neq 6, -5$$

4. $\frac{3}{x+5} = \frac{7}{x-3} - \frac{5}{x^2+2x-15}$

$$\frac{3(x-3)}{(x+5)(x-3)} = \frac{7(x+5)}{(x+5)(x-3)} - \frac{5}{(x+5)(x-3)}$$
$$3x-9 = 7x+35-5$$
$$3x-9 = 7x+30$$
$$-4x = 39$$
$$x = \frac{-39}{4}; x \neq -5, 3$$

5. $\frac{1}{1} - \frac{3}{p-2} = \frac{p-5}{p^2+p-6}$

$$\frac{1(p+3)(p-2)}{(p+3)(p-2)} - \frac{3(p+3)}{(p+3)(p-2)} = \frac{p-5}{(p+3)(p-2)}$$
$$p^2+p-6-3p-9 = p-5$$
$$p^2-2p-15 = p-5$$
$$p^2-3p-10 = 0$$
$$(p-5)(p+2) = 0$$
$$p-5=0 \quad p+2=0$$
$$p=5, -2; p \neq -3, 2$$

6. $\frac{5}{k^2-4k+4} + 1 = \frac{6}{k^2-4k+4}$

$$\frac{5}{(k-2)(k-2)} + \frac{1(k-2)(k-2)}{(k-2)(k-2)} = \frac{6}{(k-2)(k-2)}$$
$$5+k^2-4k+4 = 6$$
$$k^2-4k+9 = 6$$
$$k^2-4k+3 = 0$$
$$(k-3)(k-1) = 0$$
$$k-3=0 \quad k-1=0$$
$$k=3, 1; k \neq 2$$

$$7. \frac{1}{v+4} = \frac{6v^2+12v-18}{v^2+6v+8} - \frac{1}{v^2+6v+8}$$

$$\frac{1(v+2)}{(v+4)(v+2)} = \frac{6v^2+12v-18}{(v+4)(v+2)} - \frac{1}{(v+4)(v+2)}$$

$$v+2 = 6v^2+12v-18 - 1$$

$$1.6 \quad 0 = 6v^2+11v-21 \quad 1.21$$

$$2.3 \quad 0 = (v+3)(6v-7) \quad 3.7$$

$$v+3=0 \quad 6v-7=0$$

$$v = -3, \frac{7}{6}; v \neq -4, -2$$

$$8. \frac{5}{x-3} + \frac{x-2}{x-3} = \frac{x+3}{x^2-6x+9}$$

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

$$5x-15 + x^2-5x+6 = x+3$$

$$x^2-9 = x+3$$

$$x^2-x-12=0$$

$$(x-4)(x+3)=0$$

$$x-4=0 \quad x+3=0$$

$$x = 4, -3; x \neq 3$$

$$9. \frac{n}{n^2+2n-15} = \frac{1}{n^2+2n-15} - \frac{2n+10}{n-3}$$

$$\frac{n}{(n+5)(n-3)} = \frac{1}{(n+5)(n-3)} - \frac{(2n+10)(n+5)}{(n-3)(n+5)}$$

$$n = 1 - (2n^2+20n+50)$$

$$n = 1 - 2n^2 - 20n - 50$$

$$0 = -2n^2 - 21n - 49$$

$$0 = 2n^2 + 21n + 49$$

$$0 = (2n+7)(n+7)$$

$$2n+7=0 \quad n+7=0$$

$$n = -\frac{7}{2}, -7; n \neq -5, 3$$

$$10. \frac{1}{n+5} + \frac{n}{n+6} = \frac{1}{n^2+11n+30}$$

$$\frac{1(n+6)}{(n+5)(n+6)} + \frac{n(n+5)}{(n+5)(n+6)} = \frac{1}{(n+5)(n+6)}$$

$$n+6 + n^2+5n = 1$$

$$n^2+6n+5=0$$

$$(n+5)(n+1)=0$$

$$n+5=0 \quad n+1=0$$

$$n = -5, -1; n \neq -5, -6$$

$$n = -1$$

$$11. \frac{2m^2-5m-3}{m^2+m-20} = \frac{5m+30}{m+5} + \frac{1}{m-4}$$

$$\frac{2m^2-5m-3}{(m+5)(m-4)} = \frac{(5m+30)(m-4)}{(m+5)(m-4)} + \frac{1(m+5)}{(m+5)(m-4)}$$

$$2m^2-5m-3 = 5m^2+10m-120+m+5$$

$$2m^2-5m-3 = 5m^2+11m-115$$

$$1.3 \quad 0 = 3m^2+16m-112 \quad 1.112$$

$$0 = (3m+28)(m-4) \quad 2.66$$

$$3m+28=0 \quad m-4=0 \quad 4.28$$

$$m = -\frac{28}{3}, -4; m \neq -5, 4$$

$$m = -\frac{28}{3}$$

$$12. \frac{m+5}{m-6} = \frac{1}{m-5} + \frac{1}{m^2-11m+30}$$

$$\frac{(m+5)(m-5)}{(m-6)(m-5)} = \frac{1(m-6)}{(m-6)(m-5)} + \frac{1}{(m-5)(m-6)}$$

$$m^2-25 = m-6 + 1$$

$$m^2-25 = m-5$$

$$m^2-m-20=0$$

$$(m-5)(m+4)=0$$

$$m-5=0 \quad m+4=0$$

$$m = 5, -4; m \neq 5, 6$$

$$m = -4$$