

13.5 Solving Rational Equations

© 2014 Kuta Software LLC. All rights reserved.

Solve each equation. Remember to check for extraneous solutions.

1) $\frac{6}{p^2} = \frac{1}{p} + \frac{1}{p^2}$

$$\frac{6(p^2)}{p^2} = \frac{1(p^2)}{p} + \frac{1(p^2)}{p^2}$$

$$6 = p + 1$$

$$\boxed{5 = p}$$

2) $\frac{3}{n^2} = \frac{1}{2n} + \frac{1}{2n^2}$

$$\frac{3(2n^2)}{n^2} = \frac{1(2n^2)}{2n} + \frac{1(2n^2)}{2n^2}$$

$$6 = n + 1$$

$$\boxed{5 = n}$$

3) $\frac{1}{k} + \frac{1}{4k^2} = \frac{1}{2k^2}$

$$\frac{1(4k^2)}{k} + \frac{1(4k^2)}{4k^2} = \frac{1(4k^2)}{2k^2}$$

$$4k + 1 = 2$$

$$4k = 1$$

$$\boxed{k = 1/4}$$

5) $\frac{m+4}{3m} = \frac{4}{m} - \frac{m^2+8m+16}{3m}$

$$\frac{m+4}{3m}(3m) = \frac{4}{m}(3m) - \frac{m^2+8m+16}{3m}(3m)$$

$$m+4 = 12 - (m^2+8m+16)$$

$$m+4 = 12 - m^2 - 8m - 16$$

$$m^2 + 9m + 8 = 0$$

$$(m+8)(m+1) = 0$$

$$\boxed{m = -8 \quad m = -1}$$

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

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

$$x^2 = x^2 + 3x - (5x - 30)$$

$$0 = 3x - 5x + 30$$

$$-30 = -2x$$

$$\boxed{15 = x}$$

6) $\frac{5}{6n^2} - \frac{n^2-7n+10}{3n^2} = \frac{1}{6n}$

$$\frac{5(6n^3)}{6n^2} - \frac{n^2-7n+10(6n^2)}{3n^2} = \frac{1}{6n}(6n)^2$$

$$5 - (2n^2 - 14n + 20) = n$$

$$5 - 2n^2 + 14n - 20 = n$$

$$-2n^2 + 13n - 15 = 0$$

$$-(2n^2 - 13n + 15) = 0$$

$$2n^2 - 10n - 3n + 15$$

$$2n(n-5) - 3(n-5)$$

$$-(2n-3)(n-5) = 0$$

$$\boxed{n = 3/2 \quad n = 5}$$

$$7) \frac{b-3}{2b^2-8b} = \frac{1}{2} + \frac{1}{2b-8}$$

$$\frac{b-3}{2b^2-8b} = \frac{1}{2} + \frac{1}{2b-8}$$

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

$$0 = b^2-4b+3$$

$$0 = (b-3)(b-1) \rightarrow \boxed{b=3 \quad b=1}$$

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

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

$$3x - (x^2+x-12) = x^2-3x$$

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

$$0 = 2x^2 - 5x - 12$$

$$2x^2 - 8x + 3x - 12$$

$$2x(x-4) + 3(x-4)$$

$$\rightarrow (2x+3)(x-4)$$

$$\boxed{x = -3/2 \quad x = 4}$$

$$11) \frac{r-4}{2r} - \frac{r^2+4r-12}{2r^2+6r} = \frac{1}{2r}$$

$$\frac{r-4}{2r} - \frac{r^2+4r-12}{2r^2+6r} = \frac{1}{2r}$$

$$r^2-r-12 - (r^2+4r-12) = r+3$$

$$-5r = r+3$$

$$-6r = 3 \rightarrow \boxed{r = -1/2}$$

$$13) \frac{n+5}{5n+4} = \frac{1}{5n+4} - 1$$

$$\frac{n+5}{5n+4} = \frac{1}{5n+4} - 1$$

$$n+5 = 1 - (5n+4)$$

$$n+5 = 1-5n-4 \rightarrow n+5 = -5n-3$$

$$6n = -8$$

$$\boxed{n = -4/3}$$

$$8) 2v-4 = \frac{1}{6} + \frac{v-4}{6v}$$

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

$$12v^2-24v = v+v-4$$

$$12v^2-26v+4=0$$

$$2(6v^2-13v+2)=0 \rightarrow 2(6v-1)(v-2)$$

$$6v^2-12v-v+2$$

$$6v(v-2)-1(v-2)$$

$$\boxed{v=1/6 \quad v=2}$$

$$10) \frac{1}{n-6} + \frac{n^2-6n+9}{n^2-6n} = 1$$

$$\frac{1}{n-6} + \frac{n^2-6n+9}{n^2-6n} = 1$$

$$n + n^2 - 6n + 9 = n^2 - 6n$$

$$n + 9 = 0$$

$$\boxed{n = -9}$$

$$12) 1 - \frac{1}{x+7} = \frac{4}{x+7}$$

$$1 - \frac{1}{x+7} = \frac{4}{x+7}$$

$$x+7 - 1 = 4$$

$$x+6 = 4$$

$$\boxed{x = -2}$$

$$14) \frac{1}{4a^2-4a-8} - \frac{1}{4a+4} = \frac{1}{4a-8}$$

$$4(a^2-a-2)$$

$$4(a-2)(a+1)$$

$$\frac{1 \cdot 4(a-2)(a+1)}{4a^2-4a-8} - \frac{1 \cdot 4(a-2)(a+1)}{4a+4} = \frac{1 \cdot 4(a-2)(a+1)}{4a-8}$$

$$1 - (a-2) = a+1$$

$$1-a+2 = a+1$$

$$-a+3 = a+1$$

$$2 = 2a$$

$$\boxed{1 = a}$$