

Ch 6 Review ~ Rational Expressions & Equations

Simplify each and state the excluded values.

$$1) \frac{28x}{38x} = \boxed{\frac{2}{3}, n \neq 0}$$

$$2) \frac{\frac{2}{5}x}{10x^6} = \boxed{\frac{2}{5n}, n \neq 0}$$

$$3) \frac{3x^2 - 12x - 36}{x - 6} = \frac{3(x^2 - 4x - 12)}{(x - 6)}$$

$$= \frac{3(x - 6)(x + 2)}{\cancel{(x - 6)}}$$

$$= \boxed{3(x + 2), x \neq 6}$$

$$4) \frac{n + 7}{5n^2 + 33n - 14} = \frac{(n + 7)}{(5n - 2)(n + 7)}$$

$$= \boxed{\frac{1}{5n - 2}, n \neq \frac{2}{5}, -7}$$

$$5n^2 + 35n - 2n - 14$$

$$5n(n + 7) - 2(n + 7)$$

$$5) \frac{3b^2 - 30b + 48}{3b^2 - 27b + 24} = \frac{\cancel{3}(b^2 - 10b + 16)}{\cancel{3}(b^2 - 9b + 8)}$$

$$= \frac{(b - 8)(b - 2)}{\cancel{(b - 8)}(b - 1)}$$

$$= \boxed{\frac{b - 2}{b - 1}, b \neq 8, 1}$$

$$6) \frac{5r^2 + 38r - 63}{5r^2 + 46r + 9} = \frac{(5r - 7)(r + 9)}{(5r + 1)(r + 9)}$$

$$= \boxed{\frac{5r - 7}{5r + 1}, r \neq -\frac{1}{5}, -9}$$

$$5r^2 + 45r - 7r - 63$$

$$5r(r + 9) - 7(r + 9)$$

$$5r^2 + 45r + r + 9$$

$$5r(r + 9) + 1(r + 9)$$

$$7) \frac{20x + 30}{70x^2 - 160x + 90} = \frac{\cancel{10}(2x + 3)}{\cancel{10}(7x^2 - 16x + 9)}$$

$$= \boxed{\frac{(2x + 3)}{(7x - 9)(x - 1)}, x \neq \frac{9}{7}, 1}$$

$$8) \frac{5n^3 + 39n^2 - 8n}{3n^3 + 28n^2 + 32n} = \frac{\cancel{n}(5n^2 + 39n - 8)}{\cancel{n}(3n^2 + 28n + 32)}$$

$$= \frac{(5n - 1)(n + 8)}{(3n + 4)(n + 8)}$$

$$= \boxed{\frac{5n - 1}{3n + 4}, n \neq 0, -\frac{4}{3}, -8}$$

$$5n^2 + 40n - n - 8$$

$$5n(n + 8) - 1(n + 8)$$

$$3n^2 + 24n + 4n + 32$$

$$3n(n + 8) + 4(n + 8)$$

$$7x^2 - 7x - 9x + 9$$

$$7x(x - 1) - 9(x - 1)$$

Simplify each expression.

$$9) \frac{\cancel{1}^1}{3x} \cdot \frac{\cancel{1}^1}{8x^3} = \boxed{\frac{1}{3x^4}}$$

$$10) \frac{8}{6n} \div \frac{10}{2} = \frac{\cancel{8}^4}{\cancel{6n}^3} \times \frac{\cancel{2}^1}{10} = \boxed{\frac{4}{15n}}$$

$$11) \frac{3}{(x+10)(\cancel{3x-4})} \cdot \frac{\cancel{1}^1}{\cancel{3(3x-4)(x-1)} \cdot \cancel{1-x}} = \boxed{\frac{-3}{(x+10)}}$$

$$12) \frac{x-1}{(5x+8)(7x-9)} \div \frac{x-4}{(5x+8)(7x-9)} = \frac{(x-1)}{(5x+8)(7x-9)} \times \frac{\cancel{(5x+8)} \cdot \cancel{(7x-9)}}{(x-4)} = \boxed{\frac{x-1}{x-4}}$$

$$13) \frac{2b^2 - 10b - 100}{4} \cdot \frac{4}{2b^2 + 28b + 90} = \frac{\cancel{2}(b^2 - 5b - 50)}{\cancel{4}} \times \frac{\cancel{4}}{\cancel{2}(b^2 + 14b + 45)} = \frac{(b-10)(b+5)}{1} \times \frac{1}{(b+9)(b+5)} = \boxed{\frac{b-10}{b+9}}$$

$$14) \frac{14x+35}{7} \div \frac{2x+5}{6} = \frac{\cancel{7}(2x+5)}{\cancel{7}} \div \frac{2x+5}{6} = \frac{(2x+5)}{1} \times \frac{6}{(2x+5)} = \boxed{6}$$

$$15) \frac{49m^2 - 14m + 1}{70m - 10} \cdot \frac{4m - 20}{14m^2 - 72m + 10} = \frac{7m^2 - 7m - 7m + 1}{7m(7m-1) - 1(7m-1)} \cdot \frac{7m^2 - 35m - m + 5}{7m(m-5) - 1(m-5)} = \frac{\cancel{7m}(\cancel{7m-1}) \cdot \cancel{7}(m-5)}{\cancel{10}(\cancel{7m-1}) \cdot \cancel{2}(\cancel{7m-1})(m-5)} = \boxed{\frac{1}{5}}$$

$$16) \frac{30n - 54}{5n^2 + 6n - 27} \div \frac{7n^2 + 32n + 16}{7n + 4} = \frac{6(5n-9)}{(5n-9)(n+3)} \div \frac{(7n+4)(n+4)}{(7n+4)} = \frac{6}{n+3} \times \frac{1}{n+4} = \boxed{\frac{6}{(n+3)(n+4)}}$$

$$17) \frac{2x-2y}{6x^3} + \frac{3x+4y}{6x^3} = \frac{5x+2y}{6x^3}$$

$$18) \frac{b-5}{6b-24} - \frac{b+4}{6b-24} = \frac{-9}{6(b-4)}$$

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

$$19) \frac{5^4b}{3a^2 \cdot 4b} + \frac{6a^{3a}}{4ab \cdot 3a} = \frac{20b}{12a^2b} + \frac{18a^2}{12a^2b}$$

$$= \frac{18a^2 + 20b}{12a^2b}$$

$$= \frac{9a^2 + 10b}{6a^2b}$$

$$20) \frac{2m}{3} - \frac{m-4n}{4mn} = \frac{8m^2n}{12mn} - \frac{3m-12n}{12mn}$$

$$= \frac{8m^2n - 3m + 12n}{12mn}$$

$$21) \frac{6x}{3x} + \frac{3x-2}{15x^2+6x} = \frac{6x}{3x} + \frac{3x-2}{3x(5x+2)}$$

$$= \frac{6x(5x+2) + (3x-2)}{3x(5x+2)}$$

$$= \frac{30x^2 + 12x + 3x - 2}{3x(5x+2)}$$

not factorable →

$$= \frac{30x^2 + 15x - 2}{3x(5x+2)}$$

$$22) \frac{x-5}{2x-6} - \frac{5}{2} = \frac{x-5}{2(x-3)} - \frac{5(x-3)}{2(x-3)}$$

$$= \frac{x-5-5x+15}{2(x-3)}$$

$$= \frac{-4x+10}{2(x-3)}$$

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

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

$$23) \frac{2}{3x} + \frac{x+1}{x^2-7x+6} = \frac{2}{3x} + \frac{(x+1)}{(x-1)(x-6)}$$

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

$$= \frac{2x^2 - 14x + 12 + 3x^2 + 3x}{3x(x-1)(x-6)}$$

not factorable →

$$= \frac{5x^2 - 11x + 12}{3x(x-1)(x-6)}$$

$$24) \frac{2n+4}{n^2-2n-8} - 2 = \frac{(2n+4)}{(n+2)(n-4)} - \frac{2(n+2)(n-4)}{(n+2)(n-4)}$$

$$= \frac{2n+4 - (2n^2 - 4n - 16)}{(n+2)(n-4)}$$

$$= \frac{-2n^2 + 6n + 20}{(n+2)(n-4)}$$

$$= \frac{-2(n^2 - 3n - 10)}{(n+2)(n-4)}$$

$$= \frac{-2(n+2)(n-5)}{(n+2)(n-4)}$$

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

Solve each equation. Remember to check for extraneous solutions.

$$25) \frac{3(b+3)}{3b^2} - \frac{1}{3b^2} = \frac{b+2}{3b^2} \quad (b \neq 0)$$

$$3b+9-1 = b+2$$

$$2b+8 = 2$$

$$2b = -6$$

$$\boxed{b = -3}$$

$$26) \frac{2(2x+2)}{2x^2} = \frac{x-3}{2x^2} - \frac{1x}{2x^2} \quad (x \neq 0)$$

$$4x+4 = x-3-x$$

$$4x+4 = -3$$

$$4x = -7$$

$$\boxed{x = -\frac{7}{4}}$$

$$27) \frac{1}{3r^2+6r+3} = \frac{3(1)}{3(r^2+2r+1)} + \frac{3(2r-6)}{3(r^2+2r+1)} \quad (r \neq -1)$$

$$1 = 3 + 6r - 18$$

$$1 = 6r - 15$$

$$16 = 6r$$

$$\frac{16}{6} = r$$

$$\boxed{\frac{8}{3} = r}$$

$$28) \frac{1}{n-1} - \frac{1}{1} = \frac{(n-1)6}{n-1} \quad (n \neq 1)$$

$$1 - (n-1) = 6$$

$$1 - n + 1 = 6$$

$$-n + 2 = 6$$

$$-n = 4$$

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

$$29) \frac{4x^2 - 3(1)x}{3x^3} + \frac{1}{3x^3} \quad (x \neq 0)$$

$$4x^2 = 3x + 1$$

$$4x^2 - 3x - 1 = 0$$

$$4x^2 - 4x + x - 1 = 0$$

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

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

$$\boxed{x = -\frac{1}{4}, 1}$$

$$30) \frac{1}{2x} = \frac{x-5}{2x} - \frac{2(x^2+x-6)}{2x} \quad (x \neq 0)$$

$$1 = x - 5 - 2x^2 - 2x + 12$$

$$2x^2 + x - 6 = 0$$

$$2x^2 + 4x - 3x - 6 = 0$$

$$2x(x+2) - 3(x+2) = 0$$

$$(2x-3)(x+2) = 0$$

$$\boxed{x = \frac{3}{2}, -2}$$

$$31) \frac{5}{b^2+6b+8} = \frac{b^2+11b+30}{b^2+6b+8} + \frac{1(b+2)}{(b+4)(b+2)} \quad (b \neq -2, -4)$$

$$5 = b^2 + 11b + 30 + b + 2$$

$$0 = b^2 + 12b + 27$$

$$0 = (b+3)(b+9)$$

$$\boxed{b = -3, -9}$$

$$32) \frac{n-5}{n^2+2n} = \frac{5}{1} + \frac{1(n)}{n+2} \quad (n \neq 0, -2)$$

$$n-5 = 5n^2 + 10n + n$$

$$0 = 5n^2 + 10n + 5$$

$$0 = 5(n^2 + 2n + 1)$$

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

$$\boxed{n = -1}$$

Solve each question. Round your answer to the nearest hundredth.

- 33) It takes Ashley ten hours to pick forty bushels of apples. Daniel can pick the same amount in 11 hours. If they worked together how long would it take them?

	# of hrs	work done in 1 hr	work done in x hrs
A.	10	$\frac{1}{10}$	$\frac{x}{10}$
D.	11	$\frac{1}{11}$	$\frac{x}{11}$
A+D	x	$\frac{1}{x}$	$\frac{x}{x} = 1$

$\frac{1}{10} + \frac{1}{11} = \frac{1}{x}$ or $\frac{x}{10} + \frac{x}{11} = 1$
 $11x + 10x = 110$ $11x + 10x = 110$
 $21x = 110$
 $x = \boxed{5.24 \text{ hrs}}$

- 34) Working alone, it takes Natalie nine hours to dig a 10 ft by 10 ft hole. Dan can dig the same hole in eight hours. How long would it take them if they worked together?

$$\frac{1}{9} + \frac{1}{8} = \frac{1}{x}$$

$$8x + 9x = 72$$

$$17x = 72$$

$$x = \boxed{4.24 \text{ hrs}}$$

- 35) Working together, Shanice and Perry can pick forty bushels of apples in 5.65 hours. Had he done it alone it would have taken Perry 10 hours. Find how long it would take Shanice to do it alone.

$$\frac{1}{x} + \frac{1}{10} = \frac{1}{5.65}$$

$$56.5 + 5.65x = 10x$$

$$56.5 = 4.35x$$

$$x = \boxed{12.99 \text{ hrs}}$$

- 36) Working together, Jaidee and Jasmine can paint a fence in 4.74 hours. Had she done it alone it would have taken Jasmine ten hours. Find how long it would take Jaidee to do it alone.

$$\frac{1}{4.74} - \frac{1}{10} = \frac{1}{x}$$

$$10x - 4.74x = 47.4$$

$$5.26x = 47.4$$

$$x = \boxed{9.01 \text{ hrs}}$$

Answers to Ch 6 Review ~ Rational Expressions & Equations

1) $\frac{2}{3}; \{0\}$

2) $\frac{2}{5n}; \{0\}$

3) $3(x+2); \{6\}$

4) $\frac{1}{5n-2}; \left\{\frac{2}{5}, -7\right\}$

5) $\frac{b-2}{b-1}; \{8, 1\}$

6) $\frac{5r-7}{5r+1}; \left\{-9, -\frac{1}{5}\right\}$

7) $\frac{2x+3}{(x-1)(7x-9)}; \left\{1, \frac{9}{7}\right\}$

8) $\frac{5n-1}{3n+4}; \left\{0, -8, -\frac{4}{3}\right\}$

9) $\frac{1}{3x^4}$

10) $\frac{4}{15n}$

11) $-\frac{3}{x+10}$

12) $\frac{x-1}{x-4}$

13) $\frac{b-10}{b+9}$

14) 6

15) $\frac{1}{5}$

16) $\frac{6}{(n+3)(n+4)}$

17) $\frac{5x+2y}{6x^3}$

18) $-\frac{3}{2b-8}$

19) $\frac{10b+9a^2}{6a^2b}$

20) $\frac{8m^2n-3m+12n}{12mn}$

21) $\frac{30x^2+15x-2}{3x(5x+2)}$

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

23) $\frac{5x^2-11x+12}{3x(x-6)(x-1)}$

24) $\frac{-2n+10}{n-4}$

25) $\{-3\}$

26) $\left\{-\frac{7}{4}\right\}$

27) $\left\{\frac{8}{3}\right\}$

28) $\{-4\}$

29) $\left\{1, -\frac{1}{4}\right\}$

30) $\left\{\frac{3}{2}, -2\right\}$

31) $\{-9, -3\}$

32) $\{-1\}$

33) 5.24 hours

34) 4.24 hours

35) 12.99 hours

36) 9.01 hours