

5/8/19

Simplifying Rational Expressions

Simplify each and state the excluded values.

1) $\frac{12}{8a-12} = \frac{12 \cdot 3}{4(2a-3)}$

$\frac{3}{2a-3}; a \neq \frac{3}{2}$

2) $\frac{25p+20}{25} = \frac{5(5p+4)}{5 \cdot 5}$

$\frac{5p+4}{5}$ no excluded values

3) $\frac{x-4}{4x-16} = \frac{\cancel{(x-4)}}{4\cancel{(x-4)}} = \frac{1}{4}$
 $x \neq 4$

$\frac{1}{4}; x \neq 4$

4) $\frac{n-4}{n^2-n-12} = \frac{\cancel{(n-4)}}{\cancel{(n-4)}(n+3)}$
 $n \neq 4, n \neq -3$

$\frac{1}{n+3}; n \neq 4, -3$

5) $\frac{80n^2}{n+4} \div \frac{1}{n+4} = \frac{80n^2}{n+4} \cdot \frac{n+4}{1}$

$80n^2; n \neq -4$

6) $\frac{r^2+5r-6}{r-1} \div \frac{r+6}{r+2} = \frac{r^2+5r-6}{r-1} \cdot \frac{r+2}{r+6}$
 $r \neq -1$

$\frac{(r+6)(r-1)}{r-1} \cdot \frac{(r+2)}{(r+6)}$
 $r \neq 1$
 $r+2; r \neq -6, -2, 1$

7) $\frac{7}{x-7} \cdot \frac{6x^2+8x}{21x+28}$

$\frac{7}{x-7} \cdot \frac{2x(3x+4)}{7(3x+4)}$
 $x \neq 7, x \neq -\frac{4}{3}$

$\frac{2x}{x-7}; x \neq 7, -\frac{4}{3}$

8) $\frac{b+10}{b-6} \div \frac{b^2+12b+20}{7b+14} = \frac{b+10}{b-6} \cdot \frac{7b+14}{b^2+12b+20}$
 $b \neq -2$

$\frac{(b+10)}{(b-6)} \cdot \frac{7(b+2)}{(b+10)(b+2)}$
 $b \neq 6, b \neq -10, b \neq -2$

$\frac{7}{b-6}; b \neq -10, -2, 6$

$$9) \frac{21a-49}{27a^2-63a} \cdot \frac{4a}{7}$$

$$\frac{\cancel{7}(3a-7)}{9a(3a-7)} \cdot \frac{4\cancel{a}}{1}$$

\downarrow
 $a \neq \frac{7}{3}$

$$\frac{4}{9}; a \neq \frac{7}{3}$$

$$10) \frac{7k}{5k^2+15k} \div \frac{k-6}{18+3k-k^2} = \frac{7k}{5k^2+15k} \cdot \frac{-k^2+3k+18}{k-6}$$

$$\frac{7k}{5k(k+3)} \cdot \frac{-1(k^2-3k-18)}{(k-6) \cdot \cancel{k+6} \cdot \cancel{k+3} \cdot k \neq -3}$$

$$\frac{7k}{5k(k+3)} \cdot \frac{-1(\cancel{k-6})(k+3)}{(k-6)}$$

\downarrow \downarrow \downarrow
 $k \neq 0$ $k \neq -3$ $k \neq 6$

$$\boxed{-\frac{7}{5}; k \neq 0, -3, 6}$$

$$11) \frac{m^2+7m-30}{m+10} \div \frac{m-3}{2m}$$

$$\frac{(m+10)(m-3)}{(m+10)} \cdot \frac{2m}{(m-3)}$$

\downarrow \downarrow
 $m \neq -10$ $m \neq 3$

$$2m; m \neq -10, 0, 3$$

$$12) \frac{5}{x-4} \div \frac{5}{7x^3-28x^2} \quad \leftarrow x \neq 0 \quad \leftarrow x \neq 4$$

$$\frac{5}{(x-4)} \cdot \frac{7x^2(x-4)}{5}$$

\downarrow
 $x \neq 4$

$$\boxed{7x^2; x \neq 0, 4}$$

$$13) \frac{1}{x-5} \div \frac{6x-54}{x^2-19x+90} \quad \leftarrow x \neq 9 \quad \leftarrow x \neq 10$$

$$\frac{1}{(x-5)} \cdot \frac{(x-9)(x-10)}{6(x-9)}$$

\downarrow \downarrow
 $x \neq 5$ $x \neq 9$

$$\boxed{\frac{x-10}{6(x-5)}; x \neq 5, 9, 10}$$

$$14) \frac{3r}{r^2+12r+32} \div \frac{1}{r+4} \quad \leftarrow r \neq -4$$

$$\frac{3r}{(r+8)(r+4)} \cdot \frac{(r+4)}{1}$$

\downarrow \downarrow
 $r \neq -8$ $r \neq -4$

$$\boxed{\frac{3r}{r+8}; r \neq -8, -4}$$

Simplify each expression.

$$15) \frac{x+3y}{12xy} + \frac{6x}{12xy}$$

$$\boxed{\frac{1x+3y}{12xy}}$$

$$16) \frac{u+4v}{12uv^2} + \frac{u-6v}{12uv^2}$$

$$\frac{2u-2v}{12uv^2} = \frac{2(u-v)}{6 \cdot 2uv^2}$$

$$\boxed{\frac{u-v}{6uv^2}}$$

$$17) \frac{7}{2} - \frac{2}{7n+8}$$

$$\frac{LCD}{2(7n+8)}$$

$$\frac{49n+56-4}{2(7n+8)} = \boxed{\frac{49n+52}{2(7n+8)}}$$

$$18) \frac{5}{7} + \frac{n+1}{n-5}$$

$$\frac{LCD}{7(n-5)}$$

$$\frac{5n-25+n+7}{7(n-5)}$$

$$\boxed{\frac{6n-18}{7(n-5)}}$$

$$19) \frac{8k}{k-7} + \frac{2k}{k-6}$$

$$\frac{LCD}{(k-7)(k-6)}$$

$$\frac{8k^2-48k+2k^2-14k}{(k-7)(k-6)}$$

$$\boxed{\frac{10k^2-62k}{(k-7)(k-6)}}$$

$$20) \frac{4v}{3} + \frac{8}{6v-10}$$

$$\frac{LCD}{3 \cdot 2 \cdot (3v-5)}$$

$$\frac{8v(3v-5)+24}{3 \cdot 2(3v-5)} = \frac{24v^2-40v+24}{3 \cdot 2(3v-5)}$$

$$\frac{2(12v^2-20v+12)}{2 \cdot 3(3v-5)} = \boxed{\frac{12v^2-20v+12}{3(3v-5)}}$$

$$21) \frac{7}{k-8} - \frac{3}{k-3}$$

$$\frac{LCD}{(k-8)(k-3)}$$

$$\frac{7k-21-3k+24}{(k-8)(k-3)}$$

$$\boxed{\frac{4k+3}{(k-8)(k-3)}}$$

$$22) \frac{7}{7b^2+35b} - \frac{6b}{b+7}$$

$$\frac{LCD}{7b(b+5)(b+7)}$$

$$\frac{7b+49-42b^2(b+5)}{7b(b+5)(b+7)} = \frac{7b+49-42b^3-210b^2}{7b(b+5)(b+7)}$$

$$\frac{4(b+7-6b^3-30b^2)}{7b(b+5)(b+7)} = \boxed{\frac{-6b^3-30b^2+b+7}{b(b+5)(b+7)}}$$

$$23) 5n - \frac{(n^2 - 8n + 12)(n+4)}{n^2 - 8n + 12}$$

$$\frac{LCD}{(n-6)(n-2)}$$

$$\frac{5n^3 - 40n^2 + 60n - n - 4}{(n-6)(n-2)}$$

$$\boxed{\frac{5n^3 - 40n^2 + 59n - 4}{(n-6)(n-2)}}$$

$$24) \frac{(b+5)(b-5)}{12b-24} - \frac{9b}{8 \cdot 12(b-2)(b-5)}$$

$$\frac{LCD}{12(b-2)(b-5)}$$

$$\frac{b^2 - 5b + 5b - 25 - 96b + 192}{12(b-2)(b-5)}$$

$$\boxed{\frac{b^2 - 96b + 167}{12(b-2)(b-5)}}$$

$$25) 4 - \frac{(35v^3 + 140v^2 + 105v)4v}{35v^3 + 140v^2 + 105v}$$

$$\frac{LCD}{35v(v+3)(v+1)}$$

$$\frac{140v^3 + 560v^2 + 420v - 4v}{35v(v+3)(v+1)}$$

$$\frac{140v^3 + 560v^2 + 416v}{35v(v+3)(v+1)}$$

$$\frac{v(140v^2 + 560v + 416)}{35v(v+3)(v+1)}$$

$$\boxed{\frac{140v^2 - 560v + 416}{35(v+3)(v+1)}}$$

$$26) \frac{4(x-1)}{x-8} - \frac{8}{x-1}$$

$$\frac{LCD}{(x-8)(x-1)}$$

$$\frac{4x - 4 - 8x + 64}{(x-8)(x-1)}$$

$$\boxed{\frac{-4x + 60}{(x-8)(x-1)}}$$