

Rational Expressions / Functions Review

1.) $\frac{12x^2 - 30x}{20x^3 - 50x^2}$ GCF $\rightarrow \frac{6x(2x-5)}{10x^2(2x-5)} = \boxed{\frac{3}{5x}}$

"remember" $\rightarrow x^{-1} = \frac{1}{x}$

2.) $\frac{4a^2 - 36}{24 - 8a}$ GCF $\rightarrow \frac{4(a^2 - 9)}{8(\cancel{a^3} - a)} \xrightarrow{D.O.S} = \frac{4(a-3)(a+3)}{8(3-a)}$

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

$\rightarrow -1$

3.) $\frac{n^2 - 13n + 40}{3n^2 - 14n - 5} \rightarrow \frac{-5 \times -8}{-13} \rightarrow \frac{(n-5)(n-8)}{(3n+1)(n-5)} = \boxed{\frac{n-8}{3n+1}}$

$\rightarrow \frac{-15 \times 1}{-14} \rightarrow 3n^2 - 15n + n - 5 = 3n(n-5) + 1(n-5)$

4.) $\frac{6p^2 - 13p + 5}{2p^2 + 17p - 9} \cdot \frac{p^2 + 16p + 63}{4p + 28}$

$\rightarrow \frac{-10 \times -3}{-13} \rightarrow 6p^2 - 10p - 3p + 5 = 2p(3p-5) - 1(3p-5) = (2p-1)(3p-5)$

$\rightarrow \frac{-18 \times -1}{17} \rightarrow 2p^2 + 18p - p - 9 = 2p(p+9) - 1(p+9) = (2p-1)(p+9)$

$\rightarrow \frac{6 \times 3}{7 \times 9} \rightarrow (p+7)(p+9)$

4. continued)

$$\frac{(2p-1)(3p-5)}{(2p-1)(p+9)} \cdot \frac{(p+7)(p+9)}{4(p+7)} = \boxed{\frac{3p-5}{4}}$$

5) $\frac{50-2w^2}{3w^2+9w-30} \cdot \frac{w^2+5w-14}{6w-30}$ ~~$\frac{2(w+5)(w-2)}{6(w-5)}$~~

→ GCF $\Rightarrow 2(25-w^2)$ $\rightarrow \frac{+4}{5} \cdot 2(w+7)(w-2)$

DoS = $2(5-w)(5+w)$

→ GCF $\Rightarrow 3(w^2+3w-10)$

$\frac{-10}{3} \cdot 2 \cdot 3(w+5)(w-2)$

$$= \frac{2(5-w)(5+w)}{3(w+5)(w-2)} \cdot \frac{(w+7)(w-2)}{6(w-5)}$$

$\hookrightarrow -1$

$$= \frac{-2(w+7)}{18} = \boxed{\frac{-(w+7)}{9}}$$

6.) $\frac{5y+5}{2} \div \frac{25y-20}{40y^2-32y}$

KFC $\Rightarrow \frac{5y+5}{2} \cdot \frac{40y^2-32y}{25y-20} = \frac{5(y+1)}{2} \cdot \frac{8y(5y+4)}{5(5y+4)}$

$$= \frac{40y(y+1)}{10} = \boxed{4y(y+1)}$$

$$7.) \frac{2c^2 + 4c - 6}{4c^2 - 7c + 3} \div \frac{16c^2 + 48c}{16c^2 - 9}$$

KFC \rightarrow

$$\frac{2c^2 + 4c - 6}{4c^2 - 7c + 3} \cdot \frac{16c^2 - 9}{16c^2 + 48c} = \frac{2(\cancel{c+3})(c-1)}{(\cancel{4c+3})(c-1)} \cdot \frac{(4c+3)(\cancel{4c-3})}{16c(\cancel{c+3})}$$

$$\begin{aligned} & \xrightarrow{\substack{12 \\ -4 \\ -7}} 2(c^2 + 2c - 3) \cdot \frac{4c^2 - 4c - 3c + 3}{16c} = \frac{2(4c+3)}{16c} \\ & \xrightarrow{\substack{3 \\ -1}} 2(c+3)(c-1) \cdot \frac{4c(c-1) - 3(c-1)}{(4c-3)(c-1)} = \frac{(4c+3)}{8c} \end{aligned}$$

$$8.) \frac{6x - x - 20}{x^2 - 16} = \frac{5x + 20}{x^2 - 16} = \frac{5(x+4)}{(x+4)(x-4)} = \boxed{\frac{5}{x-4}}$$

$$9.) \frac{16}{3} - \frac{4k+5b}{3k+15} = \frac{16}{3} - \frac{4k+5b}{3(k+5)} = \frac{16k+80}{3(k+5)} - \frac{(4k+5b)}{3(k+5)}$$

$$= \frac{12k+24}{3(k+5)} = \frac{12(k+2)}{3(k+5)} = \boxed{\frac{4(k+2)}{k+5}}$$

$$10.) \frac{m^2 - 7m - 18}{m^2 - 10m + 9} + \frac{6}{m-1} = \frac{m^2 - 7m - 18}{(m-9)(m-1)} + \frac{6 \cdot (m-9)}{(m-1) \cdot (m-9)}$$

$\begin{array}{l} \swarrow -9 \\ \searrow -1 \\ \hline -10 \end{array}$

$$= \frac{m^2 - 7m - 18}{(m-9)(m-1)} + \frac{6m - 54}{(m-9)(m-1)} = \frac{m^2 - m - 72}{(m-9)(m-1)}$$

$$\begin{array}{l} -9 \\ \swarrow \quad \searrow \\ \hline -1 \end{array} \begin{array}{l} -72 \\ \swarrow \quad \searrow \\ \hline -8 \end{array} \rightarrow \frac{(m-9)(m+8)}{(m-9)(m-1)} = \boxed{\frac{m+8}{m-1}}$$

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

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

$$\begin{array}{l} \swarrow -12 \\ \searrow -1 \\ \hline 11 \end{array}$$

$$\begin{array}{l} 2r^2 + 12r - r - 6 \\ 2r(r+6) - 1(r+6) \\ (2r-1)(r+6) \end{array}$$

$$\downarrow$$

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

$$= \boxed{\frac{r+6}{2r+1}}$$

Cross multiply

$$12.) \frac{a-8}{a} \neq \frac{3}{a+5} \rightarrow (a-8)(a+5) = 3a$$

$$a^2 + 5a - 8a - 40 = 3a$$

$$a^2 - 3a - 40 = 3a$$

$$-3a \quad -3a$$

$$\begin{array}{r} -40 \\ -10 \times 4 \\ -6 \end{array}$$

$$(a-10)(a+4) = 0 \leftarrow a^2 - 6a - 40 = 0$$

$$\boxed{a = 10, -4} \checkmark$$

$$13.) \cancel{\frac{3}{2n} + \frac{1}{n^2}} = \frac{n-2}{2n^2} \quad 2n^2 \quad LCD = 2n^2$$

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

$$3n + 2 = n - 2$$

$$2n + 2 = -2$$

$$2n = -4$$

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