7.1 Multiplying and dividing rational functions

Ex 1: Simplify and state any restrictions

a) $\dfrac{3p^2 - 6p}{p-2}$ ← ① Find GCF

$3p$

$3p(p-2)$

② Rewrite $\dfrac{3p(p-2)}{p-2}$

③ Simplify $\boxed{3p}$

Restrictions: remember we cannot divide by 0, so

$p - 2 \neq 0$

so $\boxed{p \neq 2}$

b) $\dfrac{x^2 - 7x + 10}{x^2 - 11x + 18}$ ① No GCF so factor what $\times c$ $+b$

$x^2 - 7x + 10 \qquad x^2 - 11x + 18 \quad ax^2 + bx + c$

$(x-5)(x-2) \qquad (x-9)(x-2)$

② Rewrite $\dfrac{(x-5)(x-2)}{(x-9)(x-2)}$

③ Simplify $\boxed{\dfrac{x-5}{x-9}}$

$x - 9 \neq 0 \qquad x - 2 \neq 0$

$\boxed{x \neq 9} \qquad \boxed{x \neq 2}$

Try it...

a) $\dfrac{10k^2 - 50k}{k-5}$

$\dfrac{10k(k-5)}{k-5}$

$10k, \ k \neq 5$

b) $\dfrac{m^2 - 10m + 21}{m^2 - 3m - 28}$

$\dfrac{(m-7)(m-3)}{(m-7)(m+4)}$

$\dfrac{m-3}{m+4} \qquad m \neq 7 \ m \neq -4$

Ex 2: $\dfrac{5(7a+5)}{3(a+4)} \cdot \dfrac{3(a+4)}{3(7a+5)}$

already factored

$\boxed{\dfrac{5}{3}}$

b) $\dfrac{3n+24}{n^2 + 10n + 16} \cdot \dfrac{n+8}{10n+80}$

$\dfrac{3(n+8)}{(n+8)(n+2)} \cdot \dfrac{n+8}{10(n+8)}$

$\boxed{\dfrac{3}{10(n+2)}} = \dfrac{3}{10n+20}$

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Try it... a) $\dfrac{10b(b-3)}{b-3} \cdot \dfrac{4(b-6)}{4}$

$10b(b-6)$

$\boxed{10b^2 - 60b}$

b) $\dfrac{x^2-x-42}{5x+5} \cdot \dfrac{5x-5}{+x^2+8x+7}$

$\dfrac{(x-7)(x+6)}{5(x+1)} \cdot \dfrac{5(x-1)}{-(x-7)(x-1)}$

$\dfrac{x+6}{-(x+1)} = \boxed{\dfrac{x+6}{-x-1}}$

$*$ Same as multiplication w/ keep change flip

Ex 3 a) $\dfrac{2x}{2(x-5)} \div \dfrac{1}{2(x-5)}$

$\dfrac{2x}{2(x-5)} \cdot \dfrac{3(x-5)}{1}$

$\boxed{2x}$

b) $\dfrac{4x-8}{10x-70} \div \dfrac{8-2x-x^2}{x^2-3x-28}$

$\dfrac{4x-8}{10x-70} \cdot \dfrac{x^2-3x-28}{-(x^2+2x-8)}$

$\dfrac{4(x-2)}{10(x-7)} \cdot \dfrac{(x-7)(x+4)}{-(x+4)(x-2)}$

$\dfrac{4}{-10} = \boxed{-\dfrac{2}{5}}$

Try it... a) $\dfrac{(10-r)(r-5)}{(r-10)(r-5)} \div \dfrac{45r}{r+7}$

to make same
$(10-r)$
pull out $-(-10+r)$

$\dfrac{(10-r)(r-5)}{(r-10)(r-5)} \cdot \dfrac{r+7}{45r}$

$\dfrac{-(-10+r)(r+7)}{45r(r-10)} = \dfrac{-(r+7)}{45r}$

$= \boxed{\dfrac{-r-7}{45r}}$

b) $\dfrac{5v-5}{v+3} \div \dfrac{3-3v}{3v+9}$

$\dfrac{5v-5}{v+3} \cdot \dfrac{3v+9}{3-3v}$

$\dfrac{5(v-1)}{v+3} \cdot \dfrac{3(v+3)}{-3(-1+v)}$

$\boxed{-5}$