

4.2: Multiply & Divide Rational Functions

Ex 1) $\frac{x^2}{x+9} \cdot \frac{x^2+15x+54}{x^2-4x}$

$(x^2) + 15x + (54)$ $54x^2$
 $\frac{x^2}{x} + \frac{9x}{x} + \frac{6x}{x} + \frac{54}{x}$ $\frac{9x}{x} + \frac{6x}{x} = 15x$
 $x(x+9) \mid +6(x+9)$

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

$(x+9)(x+6)$

$\frac{x^2}{(x+9)} \cdot \frac{(x+9)(x+6)}{x(x-4)}$

$x+9 \neq 0$
 $x \neq 0$
 $x-4 \neq 0$

$x \neq -9, 0, 4$

$\frac{x(x+6)}{(x-4)}$

Ex 2) $\frac{6v^2+7v+2}{3v^2-17v+10} \cdot \frac{12v^2-8v}{4v^2-1}$

$(6v^2) + 7v + (2)$ $12v^2$
 $\frac{6v^2}{3v} + \frac{3v}{3v} + \frac{4v}{2} + \frac{2}{2}$ $\frac{3v}{3v} + \frac{4v}{v} = 7v$
 $3v(2v+1) \mid +2(2v+1)$
 $(2v+1)(3v+2)$

$(3v^2) - 17v + (10)$ $30v^2$
 $\frac{3v^2}{3v} - \frac{15v}{3v} \mid \frac{-2v+10}{-2} - \frac{-15v+2}{-2} = -17v$
 $3v(v-5) \mid -2(v-5)$
 $(v-5)(3v-2)$

$$\frac{12v^2 - 8v}{4v \cdot 4v}$$

$$4v(3v-2)$$

$$4v^2 - 1$$

$$\sqrt{4v^2} = 2v$$

$$\sqrt{1} = 1$$

$$(2v+1)(2v-1)$$

$$\frac{(3v+2)(2v+1)}{(v-5)(3v-2)}$$

$$\frac{4v(3v-2)}{(2v+1)(2v-1)}$$

$$v-5 \neq 0$$

$$3v-2 \neq 0$$

$$2v+1 \neq 0$$

$$2v-1 \neq 0$$

$$v \neq 5, \frac{2}{3}, \pm \frac{1}{2}$$

$$\frac{4v(3v+2)}{(v-5)(2v-1)}$$

you try: $\frac{5x+15}{x^2-9} \cdot \frac{8x+24}{20} = \frac{5(x+3)}{(x+3)(x-3)} \cdot \frac{8(x+3)}{20x}$

$$\frac{8x+24}{20}$$

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

$$\frac{8(x+3)}{20x}$$

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

$$x \neq \pm 3$$

* division can be rewritten a multiplication by the reciprocal

$$m \neq \pm 3, \pm 6$$

Ex 3) $\frac{m^2 + 9m + 18}{m^2 - 9} \div \frac{m+6}{m-6}$ flip

$$m^2 + 9m + 18$$

$$(m+6)(m+3)$$

change

$$m^2 - 9$$

$$(m+3)(m-3)$$

$$\frac{(m+6)(m+3)}{(m+3)(m-3)}$$

$$\cdot \frac{(m-6)}{(m+6)}$$

$$\frac{m-6}{m-3}$$

Ex 4) $\frac{j+4}{j-4} \div \frac{(j^2-16)}{1} \Downarrow$

$\frac{j+4}{j-4} \cdot \frac{1}{(j+4)(j-4)}$

$j \neq \pm 4$

$$\frac{1}{(j-4)^2}$$

Ex 5) $\frac{-12b+18}{b^2-25} \times$
 $\frac{4b-6}{b^2-3b-10} \Downarrow$

$\frac{-12b+18}{-6} \quad \frac{-6}{-6}$

$(b+5)(b-5)$

$\frac{4b-6}{2(2b-3)}$

$\frac{b^2-3b-10}{(b-5)(b+2)}$

$-6(2b-3)$

$b \neq \pm 5, \frac{3}{2}, -2$

$\frac{-3 \cancel{(2b-3)}}{(b+5)(\cancel{b-5})} \cdot \frac{(\cancel{b-5})(b+2)}{\cancel{2(2b-3)}}$

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