

29.1 Multiplying and Dividing Rational Expressions

① Factor & identify restrictions (when denominator = 0)

② Cancel common factors

└ with multiplication: everything becomes one fraction

└ with division: multiply by the reciprocal

$$\text{Ex \# 1 } \frac{x^2 + 5x - 14}{x^2 - 4} \cdot \frac{7x - 2}{-2x + 2}$$

$$= \frac{(x+7)(\cancel{x-2})}{(\cancel{x-2})(x+2)} \quad x \neq 2, -2$$

$$= \boxed{\frac{x+7}{x+2} ; x \neq \pm 2}$$

$$\text{Ex \# 2 } \frac{2x^2 + 7x + 3}{x^2 + 7x + 12} \cdot \frac{6x + 1}{4x + 3}$$

$$= \frac{(x+3)(\cancel{2x+1})}{(x+4)(\cancel{x+3})} \quad x \neq -4, -3$$

$$= \boxed{\frac{2x+1}{x+4} ; x \neq -4, -3}$$

$$\text{Ex \# 3 } \frac{2x^2 - 8}{x^2 - 1} \cdot \frac{x^2 + 2x + 1}{x^3 - x^2 - 2x}$$

$$\frac{2(x^2 - 4)}{x^2 - 1} \cdot \frac{x^2 + 2x + 1}{x(x^2 - x - 2)}$$

$$\frac{2(x+2)(\cancel{x-2})}{(x-1)(\cancel{x+1})} \cdot \frac{(x+1)(\cancel{x+1})}{x(\cancel{x-2})(\cancel{x+1})} \quad x \neq 1, -1, 0, 2$$

$$\boxed{\frac{2(x+2)}{x(x-1)} \quad x \neq \pm 1, 0, 2}$$

$$\text{Ex\#4 } \frac{2x+4}{x^2-25} \cdot \frac{x^2-5x-50}{4x^2-16}$$

$$\frac{2(x+2)}{(x+5)(x-5)} \cdot \frac{(x-10)(x+5)}{2^2(x-2)(x+2)} \quad x \neq \pm 5, \pm 2$$

$$\boxed{\frac{x-10}{2(x-5)(x-2)} ; x \neq \pm 5, \pm 2}$$

$$\text{Ex\#5 } \frac{x^2+5x+6}{x^2-4} \cdot \frac{5x+15}{3x^2-4x-4}$$

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

$$\frac{(x+3)(x+2)}{(x-2)(x+2)} \cdot \frac{5(x+3)}{(x-2)(3x+2)} \quad x \neq \pm 2, -\frac{2}{3}$$

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

$$\boxed{\frac{3x+2}{5} ; x \neq \pm 2, -\frac{2}{3}}$$

$$\text{Ex\#6 } \frac{6x^2}{3x^2-27} \cdot \frac{2x+2}{x^2-2x-3}$$

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

$$\frac{6x^2}{3(x-3)(x+3)} \cdot \frac{2(x+1)}{(x-3)(x+1)} \quad x \neq \pm 3, -1$$

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

$$\boxed{\frac{x^2}{x+3} ; x \neq \pm 3, -1}$$

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