

1. Find the domain of $\frac{x^2-2x-15}{3x^2+8x-3}$ and then simplify the rational expression.

$$3x^2 + 8x - 3 = 0$$

$$(3x-1)(x+3) = 0$$

$$\begin{array}{ccc} \downarrow & & \downarrow \\ 3x-1=0 & & x+3=0 \\ x=\frac{1}{3} & & x=-3 \end{array}$$

Simplify:

$$\frac{x^2-2x-15}{3x^2+8x-3} = \frac{\cancel{(x+3)}(x-5)}{(3x-1)\cancel{(x+3)}}$$

$$= \boxed{\frac{x-5}{3x-1}}$$

Domain: $\boxed{(-\infty, -3) \cup (-3, \frac{1}{3}) \cup (\frac{1}{3}, \infty)}$

2. Simplify: $\frac{x^2+2xy-3y^2}{2x^2+5xy-3y^2}$

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

$$= \boxed{\frac{x-y}{2x-y}}$$

3. Multiply and simplify: $\frac{x^2+4x+4}{x^2+8x+16} \cdot \frac{(x+4)^3}{(x+2)^3}$

$$= \frac{\cancel{(x+2)^2}}{\cancel{(x+4)^2}} \cdot \frac{(x+4)^{\cancel{3}^1}}{(x+2)^{\cancel{3}^1}}$$

$$= \boxed{\frac{x+4}{x+2}}$$

4. Multiply and simplify: $\frac{6y+2}{y^2-1} \cdot \frac{1-y}{3y^2+y}$

$$= \frac{2 \cancel{(3y+1)}}{(y+1)\cancel{(y-1)}} \cdot \frac{\overset{(-1)}{\cancel{1-y}}}{y(3y+1)}$$

$$= \boxed{\frac{-2}{y(y+1)}}$$

5. Divide and simplify: $\frac{x^2-x}{15} \div \frac{x-1}{5}$

$$= \frac{x^2-x}{15} \cdot \frac{5}{x-1}$$

$$= \frac{x \cancel{(x-1)}}{\underset{3}{\cancel{15}}} \cdot \frac{\overset{1}{\cancel{5}}}{\cancel{x-1}}$$

$$= \boxed{\frac{x}{3}}$$

6. Divide and simplify: $(x^2 + 4x - 5) \div \frac{x^2-25}{x+7}$

$$= \frac{x^2+4x-5}{1} \cdot \frac{x+7}{x^2-25}$$

$$= \frac{\cancel{(x+5)}(x-1)}{1} \cdot \frac{x+7}{\cancel{(x+5)}(x-5)}$$

$$= \boxed{\frac{(x-1)(x+7)}{x-5}}$$

Q: A man rode his horse into town on Tuesday. Two days later he rode home on Tuesday. How is this possible?