

Simplifying Rational Expressions

$$1. \quad \frac{30}{x^2+4x-12} \div \frac{6x}{x-2} = \frac{30}{(x+6)\cancel{(x-2)}} \cdot \frac{\cancel{x-2}}{6x}$$

$$= \frac{30\cancel{5}}{6x(x+6)}$$

$$= \boxed{\frac{5}{x(x+6)}}$$

$x \neq -6, 0, 2$

$$2. \quad \frac{x^2-16}{x^2-10x+25} \div \frac{3x-12}{x^2-3x-10} = \frac{(x+4)\cancel{(x-4)}}{\cancel{(x-5)}(x-5)} \cdot \frac{\cancel{(x-5)}(x+2)}{3\cancel{(x-4)}}$$

$$= \boxed{\frac{(x+4)(x+2)}{3(x-5)}}$$

$x \neq 4, 5$

$$3. \quad \frac{x^2-10x+9}{x^2-1} \cdot \frac{x+4}{x^2-5x-36} = \frac{\cancel{(x-9)}\cancel{(x-1)}}{(x+1)\cancel{(x-1)}} \cdot \frac{x+4}{\cancel{(x-9)}(x+4)}$$

$$= \boxed{\frac{1}{x+1}}$$

$x \neq -4, \pm 1, 9$

$$4. \quad \frac{x^2-16}{2x+6} \cdot \frac{x+3}{x-4} = \frac{(x+4)\cancel{(x-4)}}{2\cancel{(x+3)}} \cdot \frac{\cancel{x+3}}{\cancel{x-4}}$$

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

$x \neq -3, 4$

$$5. \quad \frac{x^2+10x+25}{x^2-9} \cdot \frac{x^2+3x}{x+5} = \frac{\cancel{(x+5)}(x+5)}{\cancel{(x+3)}(x-3)} \cdot \frac{x\cancel{(x+3)}}{\cancel{x+5}}$$

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

$x \neq -5, \pm 3$

$$6. \frac{x^2+3x-28}{x^2+4x+4} \div \frac{x^2-49}{x^2-5x-14} = \frac{\cancel{(x+7)}(x-4)}{\cancel{(x+2)}(x+2)} \cdot \frac{\cancel{(x-7)}(x+2)}{\cancel{(x-7)}(x+7)} \quad x \neq \pm 7, -2$$

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

$$7. \frac{x^2-2x-35}{2x^3-3x^2} \cdot \frac{4x^3-9x}{7x-49} = \frac{(x-7)(x+5)}{x^2(2x-3)} \cdot \frac{x(4x^2-9)}{7(x-7)} \quad x \neq 0, 3/2, 7$$

$$= \frac{\cancel{(x-7)}(x+5)}{x^2(2x-3)} \cdot \frac{\cancel{x}(2x-3)(2x+3)}{7\cancel{(x-7)}}$$

$$= \boxed{\frac{(x+5)(2x+3)}{7x}}$$

$$8. \frac{x^3+4x}{x^2-16} \div \frac{x^2+8x+15}{x^2+x-20} = \frac{x(x^2+4)}{(x+4)\cancel{(x-4)}} \cdot \frac{\cancel{(x+5)}(x-4)}{\cancel{(x+5)}(x+3)} \quad x \neq -5, -3, \pm 4$$

$$= \boxed{\frac{x(x^2+4)}{(x+4)(x+3)}}$$

$$9. \frac{x^2-10x+21}{x-7} \cdot \frac{x^2+x-12}{(x-3)^2} = \frac{\cancel{(x-7)}(x-3)}{\cancel{x-7}} \cdot \frac{(x+4)\cancel{(x-3)}}{\cancel{(x-3)}(x-3)} \quad x \neq 3, 7$$

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

$$10. \frac{6-2x}{x^2+4x+4} \cdot \frac{x^3+2x^2}{x^8-9x^6} = \frac{-2x+6}{(x+2)(x+2)} \cdot \frac{x^2(x+2)}{x^6(x^2-9)} \quad x \neq \pm 3, 0, -2$$

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

$$= \boxed{\frac{-2}{x^4(x+2)(x+3)}}$$

$$11. \frac{x^3+3x}{x^2-9} \div \frac{x^2+5x-14}{x^2+4x-21} = \frac{x(x^2+3)}{(x+3)\cancel{(x-3)}} \cdot \frac{\cancel{(x+7)}(x-3)}{\cancel{(x+7)}(x-2)} \quad x \neq \pm 3, -7, 2$$

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